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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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Includes space law; international law; international cooperation; and patent policy.

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Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) 544

89 ASTRONOMY 544
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 545
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 546
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 547
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 548
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

99 GENERAL 549

Note: N.A. means that no abstracts were assigned to this category for this issue.

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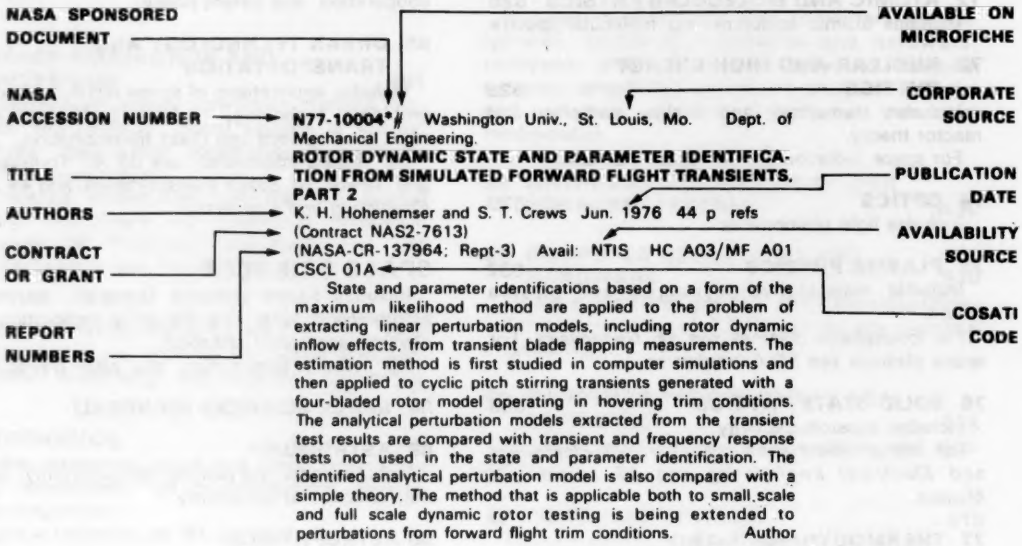
TYPICAL CITATION AND ABSTRACT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N77-10004*# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
ROTOR DYNAMIC STATE AND PARAMETER IDENTIFICATION FROM SIMULATED FORWARD FLIGHT TRANSIENTS, PART 2
K. H. Hohenemser and S. T. Crews Jun. 1976 44 p refs
(Contract NAS2-7613)
(NASA-CR-137964; Rept-3) Avail: NTIS HC A03/MF A01
CSCL 01A
State and parameter identifications based on a form of the maximum likelihood method are applied to the problem of extracting linear perturbation models, including rotor dynamic inflow effects, from transient blade flapping measurements. The estimation method is first studied in computer simulations and then applied to cyclic pitch stirring transients generated with a four-bladed rotor model operating in hovering trim conditions. The analytical perturbation models extracted from the transient test results are compared with transient and frequency response tests not used in the state and parameter identification. The identified analytical perturbation model is also compared with a simple theory. The method that is applicable both to small.scale and full scale dynamic rotor testing is being extended to perturbations from forward flight trim conditions. Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, RESEARCH OF VISUAL PROBLEMS MEDICALLY SIGNIFICANT TO ARMY AVIATION
R.W. WILEY, U.S. Army, Biooptics Division, *Ozark, Alabama* 36360 (DA0D6733)

To provide information about the visual sensory modality which has medical importance for U. S. Army aviation.

The approach will involve the employment of sound visual research practices in studying vision in its current and potential use in Army aviation.

ADDENDA: Supporting Agency Address is: MD R and D Com., (Army) Aeromedical Res. Lab., Ft. Rucker, Al. 36360

SUPPORTED BY U.S. Dept. of Defense - Army

1.0002, INVESTIGATION OF FEASIBILITY AND TRADE-OFFS OF A TRANSPORT FUSELAGE FIRE MANAGEMENT SYSTEM
UNKNOWN, Lockheed Aircraft Corporation, *Burbank, California* 91503 (FA58536; FA75WA-3657)

The technologies of early-warning fire detection and advanced fire- extinguishing agents will be considered. The fuselage compartment's fire protection needs shall be identified by a review of National Transportation Safety Board accident/incident records, or equivalent, for the period 1964-74, and fire-protection design criteria. In-flight, post-crash and unattended (RAMP) aircraft-type fires shall be considered. The timeliness of each approach in effecting greater fire protection safety shall be accounted for. The fire management provisions for each fuselage compartment shall be gauged to their fire hazard potentials, e.g., fire load in cargo compartments, flammability of fluids in hydraulic compartments, ventilation and airflows in compartments, and electrical compartment faults.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0003, ANALYTICAL INVESTIGATION OF AN IMPROVED HELICOPTER LANDING GEAR CONCEPT FOR HARD LANDING
R. GOODALL, Summa Corporation, *Culver City, California* 90230 (DA0D4008; DAAJ02-75-C-0045)

To analytically investigate the feasibility of utilizing energy-absorbing devices to attenuate and redistribute the high loads incurred by a helicopter with skid-type landing gear during hard (autorotation) landings.

A feasible concept will be developed upon which a preliminary design and analysis will be conducted. Performance, weight and cost analyses of the design will be performed and compared with the baseline aircraft (OH-6A).

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0004, DEVELOPMENT OF AN ENVIRONMENTAL DESIGN AND TEST GUIDE FOR ARMY ROTARY WING AIRCRAFT
R.A. PASELK, Rockwell International Corp., *Los Angeles, California* 90009 (DA0D4006; DAAJ02-75-C-0043)

The objective of this effort is to review and assimilate induced and natural environmental data acquired from industry and government relating to current inventory Army aircraft for the purpose of developing the methodology to establish the environmental design and test criteria or to actually establish the design and test criteria applicable to future Army aircraft programs and to publish that methodology and/or criteria as a guide for designers and planners.

Following completion of an assessment of natural environment data by MERDC and induced environment data of Army aircraft by Boeing-Vertol, that data will be compiled and combined with other data to be used as a major input for the development of an Army aircraft environmental design guide. The design guide will be developed over five fiscal years--75, 76, 77, 78, and 79. FY74 effort included the review and preliminary assessment of results of previous and current efforts being accomplished for this directorate by industry/other government agencies, and the establishment of a definitive program plan for future years. Funds will be transferred to various government agencies to defray required consultant service costs.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0005, THEORETICAL AND EXPERIMENTAL ANALYSIS OF ALKALINE ZINC BATTERIES
D.N. BENNION, Univ. of California, School of Engin. & Appl. Sci., *Los Angeles, California* 90024 (DF043860; F44620-76-C-0098)

AF function - communications, flight operations, and aircraft subsystems depend on auxiliary battery sources for power. Deficiency - longer life, lighter weight, and higher energy-density batteries are needed to meet Air Force requirements. Objective - results from this research will assist in the prediction and measurement of current density distributions, concentration distributions and their relationship to electrode design, convective flow related to membrane separator properties, and gasing of the electrodes. How work contributes - the goal of battery modeling techniques is to relate a battery's physical characteristics to its performance in service. Such a capability allows battery users to select or design a battery to specific performance requirements. The enhanced understanding will provide the battery developer with new approaches to the improvement of battery components.

To describe theoretically the current distribution in a zinc-nickel oxide (or silver oxide) electrochemical energy storage cell and to compare the predictions with actual experiments. Emphasis will be given to prediction and measuring current distribution and concentration distributions, and to determine their relation to cell potential, potential distribution, electrode structure, and other geometric and operating characteristics. Evolution of hydrogen and oxygen at their respective electrodes, and the rate and mechanism by which they are removed will be considered.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NC Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0006, AIRCRAFT SYSTEMS SYNTHESIS
R.M. CARLSON, U.S. Army, Air Mobility Res. & Dev. Lab., *Moffett Field, California* 94035 (DA0C3521)

The objective is to generate a unified direction, coordinated performance, and maximum exploitation to effect a comprehensive and balanced Army aviation research and development program responsive to Army aviation systems requirements and major thrusts.

The overall approach involves ascertaining needs and requirements of advanced airmobile systems--conducting airmobile technology assessment with technological forecasting, translating operational goals to technical objectives, providing continual analysis and assessment of technological risks to identify technological voids which may limit future development, and effecting a balanced RDT&E program via a systematic resource allocation scheme.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility R and D Laboratory, Headquarters, Ames Research Center, Moffett Field, Ca. 94035

SUPPORTED BY U.S. Dept. of Defense - Army

1.0007, AERONAUTICAL TECHNOLOGY, TECH AREA I - AERODYNAMICS TECHNOLOGY
I.C. STATLER, U.S. Army, Air Mobility Res. & Dev. Lab., *Moffett Field, California* 94035 (DA0B5001)

Implement a rotor research program to study the influence of rotor blade design, aerodynamic characteristics, and compressibility effects on rotor performance, vibration, and noise. Provide the technology base on which to establish realistic rotary-wing handling qualities criteria and to evaluate handling qualities of proposed rotary-wing systems.

In joint participation with NASA, fabricate a multipurpose rotor test system for use in the NASA-Ames 40-by-80-ft wind tunnel, with capability for testing articulated, teetering or hingeless rotors. In joint participation with NASA, implement a coordinated and integrated program of analysis, experiment, simulation, and flight test, considering various combinations of helicopter flying characteristics, stability and control augmentation, light intensifiers, and displays.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility R and D Laboratory, Ames Directorate, Ames Research Center, Moffett Field, Ca. 94035

SUPPORTED BY U.S. Dept. of Defense - Army

1.0008, STUDY OF TRANSONIC FLOW FIELDS ABOUT AIRCRAFT WITH APPLICATION TO EXTERNAL STORES
S.S. STAHARA, Nielsen Engin. & Research Inc., *Mountain View, California* 94040 (DF040660; F44620-75-C-0047)

AF function - advanced aerospace vehicles. Opportunity - improved trajectory prediction methods in the transonic regime. Objective - develop a computational program which will permit calculation of flow fields around wing body combinations in the transonic flow regime. How contributes - development of an analytical method for computing flow fields will reduce the present requirement for extensive and expensive wind-tunnel testing.

The program will be divided into three phases. In the first phase a theoretical approach to compute flow fields will be developed. In the second phase a series of wind-tunnel tests will be performed to gather the necessary baseline information. The third phase will consist of checking the computational method against experimental data and making refinements to the computational method as required.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0009, AIRCRAFT FUEL TANK/SYSTEM DATA ANALYSIS
A. STEIN, Falcon Research & Dev. Company, *Denver, Colorado* 80218 (DF134040; F33615-75-C-3060)

A major cause of combat losses is due to the high vulnerability of aircraft fuel tank/systems to nonnuclear threats. This program is part of an overall effort of the Air Force to permit realistic assessment of the fuel tank/system response to nonnuclear threat penetration. The output of this program shall serve as updated input for a design tool such as the aircraft fuel tank/system analysis computer code which enables the designer to incorporate survivability features into aircraft design.

The program is divided into four parts: 1) locating and gathering existing data which are related to fuel tank system damage and failure, 2) the reduction of the data into a convenient and standard form, 3) the analysis of the data to determine the main interactive effects, and 4) the verification or development of empirical relationships describing the probabilities of occurrence and the extent of the damage and failure.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FES, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0010, HELICOPTER TRANSMISSION VIBRATION AND NOISE REDUCTION PROGRAM
R. BOSSLER, Kaman Aerospace Corporation, *Bloomfield, Connecticut* 06002 (DA0D3929; DAAJ02-74-C-0039)

To generate clear, concise and usable, analytical tools that would, during the design stage of a program, allow the design team the capability to perform trade studies that would yield drive train components that are dynamically quiet, with inherently longer life and reduced vibration and attendant noise levels.

(1) Construct analytical prediction technique and predict vibration/noise levels of baseline test transmission, (2) Test baseline transmission, (3) Refine analysis/design and fabricate components to reduce vibration/noise levels of baseline transmission, (4) Test modified transmission, (5) Compare results and conduct user's conference.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0011, ANALYTICAL EVALUATION OF THE APPLICATION OF THE CONTROLLABLE TWIST ROTOR PRINCIPLE TO A REPRESENTATIVE UTILITY HELICOPTER
D.G. ROBINSON, Kaman Aerospace Corporation, *Bloomfield, Connecticut* 06002 (DA0D4001; DAAJ02-75-C-0038)

To analytically evaluate the realistic benefit which may be associated with application of the controllable twist rotor (CTR) to a particular Army rotary wind requirement. More specifically, to analyze the improvement which will result if the CTR is applied to UTTAS, which is representative of a current Army requirement for helicopters systems with advanced performance capability. Two different CTR applications which represent different design philosophies will be compared with a baseline configuration to project a general understanding of the maximum practical benefit obtainable with CTR.

To provide the necessary data to evaluate CTR benefits, three systems will be analyzed: (1) a conventional UTTAS system (baseline configuration), (2) a CTR system with blade number, chord and radius the same as (1), and (3) a CTR resized to satisfy the same mission requirements as in (1). Results of (1) and (2) will be compared to define relative gross weight, speed blade stress, etc. Results of (1) and (3) will be compared to identify CTR benefits in terms of reduced helicopter size and weight, increased efficiency and increased performance for a specified mission.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility R&D Laboratory, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0012, ENGINE EVALUATION OF ADVANCED TECHNOLOGY CONTROL COMPONENTS FOR ARMY AIRCRAFT GAS TURBINE ENGINES
A. WHITE, Chandler Evans Incorporated, *Hartford, Connecticut* 06101 (DA0D3919; DAAJ02-74-C-0020)

Previous research and development work, conducted under two contracts, resulted in the development of advanced control system components for small turbo-shaft engines. The objective of this contract is to evaluate the performance and durability of components in an actual engine environment.

The previously tested hardware will be repackaged or modified, as required, and installed on a small gas turbine engine. Tests will then be conducted over the full range of engine operation.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0013, SEPARATOR SCAVENGE INVESTIGATION, ARMY AIRCRAFT ENGINES

M.J. ZOCCOLI, Avco Corporation, *Stratford, Connecticut* 06497 (DA0D3988; DAAJ02-75-C-0026)

To investigate the various means of removing the sand- and dust- laden scavenge air from an integral engine inlet particle separator with the objective of providing a scavenge system which is more efficient and more durable than those currently being used. The benefits of such a system will be twofold. First, the improved efficiency will result in modest increases in power available to the aircraft and a modest improvement in SFC. Second, and most important, the improved durability will improve the engine reliability and maintainability which will result in increased aircraft availability.

Conduct a parametric analysis of each of several potential separator scavenge systems to evaluate the potential efficiency and inherent reliability of each system. Based on the above analysis, select the most promising system and identify critical components of an alternate system. Conduct detailed design of the selected system and the critical components of the alternate system and follow with fabrication and validation testing.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility Research and Development Laboratory, EUSTIS Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0014, YUH-60A OPERATIONAL STATISTICS

R. CASERIA, Sikorsky Aircraft Company, *Stratford, Connecticut* 06602 (DA0D3975; DAAJ02-75-C-0003)

Evaluate the YUH-60A UTTAS helicopter under various reliability, operational and maintenance assumptions in both the R&M and ARMS models.

The UTTAS operational scenario will be simulated with the UH-1N/R&M model. The YUH-60A UTTAS helicopter using 'mature' R&M data will be simulated with the R&M model (YUH-60A/R&M) using the UTTAS operational scenario. The YUH-60A UTTAS helicopter will be input in the ARMS (Aircraft Reliability and Maintainability Simulation) model with a detailed operational, resource, and logistics scenario.

ADDENDA: Supporting Agency Address is: AVSCOM Eustis Directorate, Air Mobility Research and Development Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0015, DESIGN, TEST AND ACCEPTANCE CRITERIA FOR HELICOPTER TRANSPARENT ENCLOSURES

B.F. KAY, Sikorsky Aircraft Company, *Stratford, Connecticut* 06602 (DA0D3955; DAAJ02-74-C-0065)

The development of design, test and acceptance criteria for helicopter transparent enclosures which will meet the mission requirements for present and future Army helicopters. The criteria to be developed will: (1) Establish trade-off factors for determining optimum transparency performance characteristics, (2) Provide a method for the Army to specify the relative importance of measurable transparency performance characteristics according to vehicle class/type or mission, and (3) Prescribe those tests which will effectively ascertain whether or not a particular transparency has satisfied the intended performance characteristics.

It is intended to: (1) Review prior studies, consolidate findings and prepare a draft specification in terms of measurable transparency performance characteristics, (2) Develop viable acceptance tests, and (3) Develop a design guide/criteria providing an assessment of the state-of-the-art. Primary emphasis under this contract will be devoted to: (1) Structural integrity, including the interactive effects of airframe stiffness, edge attachments, structural loads, thermal variations, vibration, and windshield manufacturing tolerance based on induced loads resulting from windshield/airframe contour mismatch, and (2) Development of a meaningful abrasion test.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility R&D Lab, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0016, EJECTOR THRUST AUGMENTOR WIND-TUNNEL TESTING

D.G. KOENIG, U.S. Natl. Aero. & Space Adm., *Washington, District of Columbia* 20553 (DF131370)

The aerodynamic performance of an ejector thrust augmentor (ETA) wing cannot be predicted sufficiently for use in aircraft design. To provide adequate aerodynamic technology for future fighter designs, the problems of ETA wing performance, including inlet flow, BLC control, and the force and moment characteristics must be solved. The objective is to measure performance by fabricating and testing two wind-tunnel models of ETA wings. The measurements made in these tests will validate configuration concepts and reveal areas of possible improvement. One of the wings will be a full-scale model of the proposed ETA RPV demonstrator, so the test results will be directly applicable to that design.

AFFDL and NASA-Ames will conduct a joint ETA wind-tunnel test program. Two semi-span ETA wing models will be fabricated for testing at NASA-Ames. One model will represent a STOL configuration and the other a V/STOL configuration. These models will be tested in low-speed tunnels to assess the hover and transition characteristics. The wind-tunnel balance systems will be used to acquire force and momentum data, while pressure rakes will be used for flow field analysis. The effort is dependent on the timely fabrication of the hypermixing nozzles for the augmentors.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics laboratory FXCA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0017, ANALYSIS OF HIGH-POWER COMPOSITE ENGINE PERFORMANCE

R.D. BUHLER, Univ. of Stuttgart, Space Propulsion Institute, *Stuttgart, Baden Wuerttemberg, Federal Republic of Germany* D7000 (DA0C9362; DAER075G001)

The proposed aerothermochemical analysis considers composite propulsion systems combining rocket and air-breathing components for special missions with greatly changing flight conditions, high acceleration requirements and/or V/STOL capability.

The performance capabilities of selected system configurations of this group are to be compared for simplified prototype mission-profiles on the basis of the aerothermodynamic performance results combined with estimated system weights.

ADDENDA: Supporting Agency Address Is: DARCOM Research & Standardization Group (Europe), Box 15, U.S. Army FPO, N.Y.09510. Performing organization: Universitat Stuttgart, Institut fur Raumfahrtantriebe.

SUPPORTED BY U.S. Dept. of Defense - Army

1.0018, MINIMUM-WEIGHT DESIGN OF FUSELAGE-TYPE STIFFENED CYLINDRICAL SHELLS

G.F. SIMITSES, Georgia Inst. of Technology, School of Engin. Sci. & Mech., *Atlanta, Georgia* 30332 (DF038520; AF-AFOSR-2655-74)

AF function - Air Force flight vehicles will continue to require high-performance minimum-weight structural designs. Opportunity - automated structural optimization design

techniques are under investigation in order to enhance vehicle performance. Within the field of structural optimization, the opportunity exists to pursue techniques which consider critical structural behavior phenomena in a reliable, efficient manner. Objective - the objective of the current effort in investigating structural optimization under the action of compressive loadings is to study the effect of imperfection sensitivity on optimum configurations. How work contributes - this research will provide understanding and approaches to the critical design conditions of stability for minimum-weight vehicle designs.

It has been well established that the discrepancy between theoretical predictions and experimental buckling results is primarily attributed to geometric imperfections of structural systems. In order to assess the effect of initial imperfections and accurately predict the load capacity of optimized structures it is important to include these imperfections in the analysis or perform postbuckling analyses. This research will initially study optimal designs based upon classical buckling analysis of perfect designs and then investigate the effect of imperfections in the neighborhood of the optimal design. Imperfection sensitivity analysis will consist of solving nonlinear equations for criitcal conditions in design space that incloses the optimum. Both the type and magnitude of imperfections will be studied to investigate the most critical conditions that influence the design.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0019, IOWA STATE AIRPORT SYSTEM PLAN UPDATE
R.L. CARSTENS, Iowa State Univ. of Sc. & Tech, Engineering Research Institute, *Ames, Iowa* 50011 (135010 (HRB NO.))

Objective of this study is to update the existing Iowa State Airport System Plan in preparation for initiating a continuing aviation systems planning process. Work tasks include inventories of airports, airspace, and aviation activities; forecasts of aviation activity levels; formulation of a state system of airports and air navigation facilities; description of development needs at each airport; financial forecasts; and investigation of the feasibility of a subsidized system of third-level (commuter) air carriers.

ADDENDA: Document provided to S.S.I.E. by the H.R.I.S. This project is also supported by: Iowa Department of Transportation.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0020, ROTOR WAKE EFFECTS ON HUB/PYLON FLOW SEPARATION, ARMY HELICOPTERS
O. MORINO, Aerospace Systems Incorporated, *Burlington, Massachusetts* 01803 (DA0D4017; DAAJ02-75-C-0041)

To define an analytical method to determine the total effect of the presence of the rotor in its various operating conditions on the pressure distribution and drag of rotorcraft components beneath the rotor. The effort will be concentrated on the effects of those portions of the rotor inboard of the lifting surfaces. The results will be increased capability for optimum shaping of helicopter fuselage and pylon elements for minimized drag, with the attendant improvements in overall efficiency, reduced vibration, reduced noise, reduced fuel consumption, increased payload, reduced main rotor loads, and increased speed capability.

A contract has been awarded to Aerospace Systems Incorporated to modify their computer program SUSSA which acts to account for the aerodynamic effects described above. The effects of the non-lifting portions of the rotor will be added as a subroutine to the basic program, and proof runs will be made with and without the rotor wake representation. Complete runs will be correlated with available contractor-furnished test data. Proof runs and demonstrations will also be performed on the USAAMRDL computer terminal at the end of the period of performance.

ADDENDA: Supporting Agency Address is: AVSCOM Eustis Directorate, Air Mobility R and D Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0021, STRUCTURAL RESPONSE OF BONDED MULTILAYER SHELLS
E.A. WITMER, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DA0L4562; DAAD05-75-C-0721)

To complete the development of a computer program (designated PETROS 4) for predicting transient elastoplastic, large-deflection responses of multilayer soft-bonded shell structures to prescribed loads. This analytical tool will be useful for survivability analyses of aircraft and interceptor missiles and for lethality predictions concerning reentry vehicles.

The existing version of the PETROS 4 code, which was developed under an earlier contract with the same contractor, will be modified regarding computational efficiency and input/output features. The code will then be exercised on a variety of problems to check plausibility and accuracy of solutions, which will also be compared with experimental data where available. Results will be documented in a user's manual.

ADDENDA: Supporting Agency Address is: DARCOM Ballistic Research Labs., Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

1.0022, FLAMEHOLDER COMBUSTION INSTABILITY STUDY II
G. SMITH, Northern Res. & Engin. Corp., *Cambridge, Massachusetts* 02139 (DF460120; F33615-76-C-2112)

To conduct a combined analytical and experimental research effort to determine the effects of flameholding, flame stability, and related heat release phenomena in afterburners to determine or recommend designs which control or eliminate conditions that lead to low-frequency augmentor combustion instability.

This dual award to Northern Research and Engineering Corporation shares an SOW task with Pratt and Whitney, FRDC, to concentrate on the effect of heat release phenomena on rumble in turbofan afterburners. A companion contract awarded to P and W, FRDC, deals with the rumble problem in afterburners as a whole.

ADDENDA: Supporting Agency Address is: AF Aero-Propulsion Laboratory TBC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0023, RCS MEASUREMENTS - WEATHERED LRCS OH-6A INFRARED AND ULTRAVIOLET DETECTION
E.F. BUCKLEY, Emerson & Cuming Incorporated, *Canton, Massachusetts* 02021 (DA0D4035; DAAJ02-76-C-0002)

This effort is to perform radar cross-section (RCS) measurements on an OH-6A helicopter fuselage that was partially covered with radar- absorbing material (RAM) and submitted to outside storage for 18 months.

This program will be performed in 3 tasks. Task I will require an inspection of the fuselage and retaping of the RAM panels. Task II will be the performance of RCS measurements on the fuselage for both the RAM- covered and uncovered portions. Task III is to be the evaluation of the test data, utilizing results from a prior effort for comparison.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility Research and Development Lab., Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0024, BI-CASTING AN AIR-COOLED RADIAL TURBINE
P.R. SMOOT, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0C4811)

The production of an air-cooled radial turbine would be beneficial to the realization of smaller gas turbine engines with higher specific horsepower and lower specific fuel consumption. Bi-casting has the potential for production of the part with acceptable mechanical properties throughout and with a low reject rate. It is the intent of this project to develop the necessary parameters to produce a satisfactory bi-cast radial turbine. Program thrust is cost reduction.

Lack of bonding between blade root and hub is the major problem standing in the way of development of the bi-casting process. Therefore, the reaction products at the interface which prevent bonding will be identified and a means for preventing their formation or for removing them devised. Rotors will be cast using this method and evaluated.

ADDENDA: Supporting Agency Address is: DARCOM Materials and Mechanics Research Center, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

1.0025, CRACK GROWTH TRACKING METHODS
G.S. PARKER, McDonnell Douglas Astro. Corp., *St. Louis, Missouri* 63166 (DF135330; F33615-75-C-3136)

As part of the fleet management data package (Task V of MIL-STD- 1530), contractors are required to develop tracking programs consisting of data acquisition, and analysis techniques which will provide an index of usage severity and allow estimates of crack growth to be made for critical locations in order to meet safety and durability life requirements. This procurement will support this requirement by providing a study of general tracking procedures for specific classes of aircraft. The results of this study will help in establishing tracking programs for individual fleets, reduce costs, and insure sound technical results.

This effort shall include an analytical study of the effects of usage on crack growth, development of tracking procedures, and a study of recorder and data-acquisition requirements to support the analysis. Two general classes of aircraft will be studied including a multi- mission fighter.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FBEC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0026, IEMCAP F-15 VALIDATION
R. PEARLMAN, McDonnell Douglas Astro. Corp., *St. Louis, Missouri* 63166 (DF736800; F30602-76-C-0193)

The objective of this effort is to provide a validation of the intrasystem EMC analysis program (IEMCAP) code. This is necessary to determine prediction accuracies using the different component models as well as the over-prediction resulting from frequency quantization and spectrum approximation.

The approach will be to break the F-15 aircraft up into a number of mini-systems and analyze them using the IEMCAP. These mini-systems will exercise different subroutines and models of the IEMCAP. The output of the analyses will be compared to experimental F-15 data. From this comparison conclusions on the effect of program assumptions and approximations will be formulated for future reference.

ADDENDA: Supporting Agency Address is: Rome Air Development Center RBC, Griffiss AFB, N.Y. 13440

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0027, MULTIFUNCTION INERTIAL REFERENCE ASSEMBLY FOR AIRCRAFT
R. BURNS, McDonnell Douglas Corporation, *St. Louis, Missouri* 63166 (DF138260; F33615-76-C-3132)

In a joint AFFDL/AFAL program, establish architecture and system interfaces for a modular, redundant multifunction inertial reference assembly (MIRA) for aircraft, to provide inertial and air data information for all flight-control, navigation weapon delivery and terminal-area functional requirements. Successful implementation of the MIRA approach would result in replacement of numerous rate gyros, inertial platforms, vertical gyros, lead computing gyros and compass systems. Compared to the conventional approach, life-cycle cost savings approaching 50 percent are anticipated.

This investigation will first establish functional and performance requirements for MIRA based upon mission scenario of an air superiority fighter and a medium STOL transport using computer analysis. Error budgets will be derived and reliability, safety, and survivability requirements will be defined for the missions. Next, candidate inertial and air data sensing and processing technologies will be established, considering redundancy and multiplex business requirements, and these will be analyzed in detail. Detailed preliminary mechanical and electronic designs will be accomplished. Life-cycle cost and trade analyses will be conducted and a system selected for MIRA concept demonstration. Test plans will be developed.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FGL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0028, DEVELOPMENT OF A CATALYTIC COMBUSTOR FOR AIRCRAFT GAS TURBINE ENGINES
V. SIMINSKI, Exxon Res. & Engineering Co., *Linden, New Jersey* 07036 (DF456960; F33615-75-C-2033)

This program shall employ existing catalyst technology to demonstrate the ability of a catalytic combustor in the low-power range of aircraft gas turbine combustor operating conditions. A modular approach is envisioned where the high-power operating module has confirmed feasibility, and the present task is to establish feasibility of the low-power module. Realistic temperatures, pressures, and fuels shall be considered in this program.

The contractor shall conduct theoretical studies and bench-scale testing necessary to identify and screen candidate catalyst/support combinations. Final compositions and physical designs representing the best available technology shall be constructed and supplied to AFAPL for large-scale testing to be accomplished after this program is completed.

ADDENDA: Supporting Agency Address is: AF Aero-Propulsion Laboratory SFF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0029, TACTICAL LANDING SYSTEM GUIDANCE TECHNIQUES
R. BORISS, U.S. Army, Avionics Laboratory, *Red Bank, New Jersey* 07703 (DA0B3400)

To develop a landing system technique that has (a) high potential for providing satisfactory performance in the Army's severe tactical environment, and (b) sufficient versatility to permit determination of guidance-system parameters necessary for safe helicopter instrument approaches under tactical operational conditions.

Develop a flexible scanning-beam landing system (A-scan) under contract with Airborne Instruments Laboratory to provide selectable glide slope angles, multiple localizers, variable horizontal and vertical course widths, optional DME, course softening, split or colocated siting, and altitude above touchdown. An in-house flight research program (Landing Flight Research Facility) is being conducted to evaluate scanning-beam guidance techniques and to determine necessary features of follow-on fieldworthy equipment.

ADDENDA: Supporting Agency Address Is: ECOM Avionics Lab Amsel-VL- D, Ft. Monmouth, N.J. 07703.

SUPPORTED BY U.S. Dept. of Defense - Army

1.0030, PROPAGATION TECHNIQUES (AMC CODE 692936.78.16.17.01, FY 76)
P.S. DEMKO, U.S. Army, Avionics Laboratory, *Red Bank, New Jersey* 07703 (DA0C3430)

To determine MSL siting restrictions and performance limitation with respect to beam clearance over terrain and reflections from obstacles typically found in Army landing sites to determine optimum polarization and frequency.

Available A-SCAN/TLS hardware and other laboratory devices purchased in FY75 and FY76 will be employed in field and laboratory experiments to investigate reflection effects. Reflection properties of various construction and naturally occurring materials will be theoretically and experimentally investigated for circular, eliptical, and linear polarizations. Measurements of reflection properties of actual structures at operational airports will be performed.

ADDENDA: Supporting Agency Address is: ECOM Avionics Laboratory, Ft. Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

1.0031, SELF-CONTAINED HYBRID TDMA SYSTEMS
M. FRIEDMAN, U.S. Army, Avionics Laboratory, *Red Bank, New Jersey* 07703 (DA0D2803)

The U.S. Navy (NADC Johnsville) has been developing and evaluating a radio ranging system designated as ITNS. ITNS (integrated tactical navigation system) is a time-ordered range measurement system which uses synchronized radio signals for command and control, communication, and position location between members of the radio net. Each member of the net uses these signals in conjunction with its own self-contained, dead reckoning system to establish its location in a relative grid or community. The Navy in recent years has been conducting flight tests to prove the feasibility of the ITNS system. Tests were conducted at NADC Johnsville and on board an aircraft carrier during sea maneuvers. All these tests were conducted using Navy aircraft and ships equipped with inertial navigation systems. The Navy presently plans to evaluate the ITNS concept with a 'mixed community,' i.e., using a combination of other dead reckoning navigation systems such as inertial and Doppler/AHRS. Army participation in these tests will be using an Army aircraft equipped with a Doppler/AHRS system as another member of the ITNS community. The overall objective of the program is to evaluate the use of time-ordered range measurement information for position determination in a relative grid environment. The use of external range data to update self-contained dead reckoning systems has applicability to all presently considered external references - LORAN, satellite, TACAN, Omega, as well as current self-contained systems, inertial, Doppler, and air data.

Participate in Navy flight test of ITNS at NADC Johnsville using an Army helicopter (UH-1) equipped with a dead reckoning navigation system using a fixed-antenna Doppler sensor in conjunction with a heading and attitude reference system (AN-ASN-90) in the backup mode. The Army helicopter will operate from Lakehurst, flying independently into the test range established by the Navy and will then become a user of the ITNS relative grid. Evaluation will include: (1) the length of time for the aircraft system to be acquired by the grid; (2) the use of the grid for navigation under various Army flight profiles; (3) the assessment of calibration on the deadreckoning system after losing or exiting the grid. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense - Army

1.0032, FLIR/LASER TERRAIN-FOLLOWING
R. PRIBYL, U.S. Army, Avionics Laboratory, *Red Bank, New Jersey* 07703 (DA0D2814)

The general objective is to make a determination of how the added capability of the LOTAWS as a ranging sensor enhances the functional capabilities of aircraft. Attention will initially be directed upon the integration of the LOTAWS and the FLIR for terrain-following operation, although the potential exists for additional functional applications.

A terrain-following system utilizing the LOTAWS sensor and SKC-2000 airborne computer will first be synthesized based on previous simulation analysis. Preliminary testing of the system concept and debugging of various hardware and software will then be achieved during a ground- based check-out simulation. The effort will culminate with the flight test of the system, including several levels of sophistication of terrain-following concepts, on board the experimental test vehicle.

ADDENDA: Supporting Agency Address is: ECOM Avionics Laboratory, (DRSEL-VL-F), Ft. Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

1.0033, NAVY VEHICLE DESIGN AND CONSTRUCTION - LINE VORTEX GENERATORS
R.P. WHITE, Rochester Applied Sci. Assoc., *Rochester, New York* 14618 (DN475168; N00014-74-C-0091)

To develop predictive capabilities for the application of existing and new vortex control concepts to tactical aircraft wing design. Through control of the wing-vortex interaction, large values of incremental lift can be generated permitting wings to operate at reduced angles of attack, thus alleviating stall and improving aerodynamic efficiency.

The approach to developing the predictive capability for implementation of vortex-control high-lift devices is through a systematic theoretical analysis and experimental investigation of the wing-vortex interaction. A potential flow theoretical model is being used to identify key parameters, analyze multiple wing-vortex interactions and develop design criteria for improved vortex control devices. Wind-tunnel tests are being conducted to provide performance characteristics and flow field information to demonstrate improved vortex suction lift capability and to provide a data base for comparison with theory.

ADDENDA: Supporting Agency Address is: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0034, JET FLAPS FOR HIGH-LIFT AIRFOILS
P. BARONTI, General Applied Sc. Labs. Inc., *Westbury, New York* 11590 (DF042050; F44620-76-C-0017)

Weapons delivery, air superiority and logistic support all require that the Air Force operate from short fields as well as operate and maneuver at transonic speeds. With the trend towards larger and/or higher performance vehicles, greater advantage than now is taken should be taken of using an integrated propulsion-airframe combination to obtain the high lift required for maneuver and short-field operation instead of the conventional method of increasing lift by increasing the angle of attack. The purpose of this effort is to develop the theory of the jet-flap not only at subsonic speeds but also at transonic speeds, considering not only large jet deflection angles but also mass entrainment and viscous effects with emphasis on transonic speeds.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0035, RESEARCH IN PROPULSION
E.E. BAILEY, U.S. Natl. Aero. & Space Adm., Lewis Research Center, *Cleveland, Ohio* 44199 (DA0E3530)

Conduct basic research in joint participation with the NASA-Lewis Research Center to provide a technological base in propulsion systems for aircraft applications. The program is fundamental and exploratory in nature and is a continuing effort. Topics covered include the general areas of small gas turbine technology, engine analysis, and drive train components.

Analytical and experimental studies are selected on the basis of a continual review of the Army's aviation objectives and assessment of those fundamental technology deficiencies which would prevent or impede achievement of those objectives. Specific technology is developed through research in compressors, turbines, combustors, bearings, seals, shafting, gears, materials, processes, and heat transfer. Effort is also directed toward understanding ways through which technology from large gas turbine engines can be applied to the smaller sizes applicable to Army aviation.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility R and D Laboratory, Lewis Directorate, 21000 Brookpark Road, Cleveland, Ohio 44135

SUPPORTED BY U.S. Dept. of Defense - Army

1.0036, PROPULSION TECHNOLOGY
E.E. BAILEY, U.S. Natl. Aero. & Space Adm., Lewis Research Center, *Cleveland, Ohio* 44199 (DA0E3532)

Implement research and development program for advanced propulsion and drive train components relevant to current and potential future Army aircraft configuration. Provide the technology base for evaluation of concepts for improvement and application including considerations for related needs in fabricational techniques.

In joint participation with NASA-Lewis Research Center, conduct analyses, element design, fabrication, tests, and breadboard hardware evaluation of advanced propulsion and drive train concepts. Work is jointly conducted with NASA both in their facilities and on Army-funded NASA-administrated contracts with emphasis on turboshaft engine technology including compressor, turbine, combustor and the resulting requirements on seals, shafting, bearings, gears, and material.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility R and D Laboratory, Lewis Directorate, 21000 Brookpark Road, Cleveland, Ohio 44135

SUPPORTED BY U.S. Dept. of Defense - Army

1.0037, LANDING SYSTEM RELIABILITY AND SAFETY MODEL
L.S. GEPHART, Univ. of Dayton, School of Business Admin., *Dayton, Ohio* 45409 (DF134760; F33615-74-C-3075)

No standard for evaluating the reliability and safety of a proposed AWLS configuration exists within the military or civilian agencies. The objective is to develop a model which can provide a detailed analysis of reliability/safety of the total landing system. All configurations for both primary and back-up operations will be analyzed to enhance the safety of Category III weather flight tests. The back-up modes will include human capability augmented with back-up hardware configurations. Studies using the model should be able to provide insight on obtaining the highest probability that the aircraft tests will be conducted safely in all weather landings.

The approach will be to develop a reliability/safety model of the C-141/James M. Cox Municipal Airport hardware configurations and the present technical order and FAA advisory circular operating procedures for Category III landings. After verification, the model will be adapted and modified to other aircraft configurations and other potential operating procedures. Finally, the methodologies of the model will be adapted and extended to other tests involving landing studies and tests.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FGT, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0038, ADVANCED SMALL-AXIAL TURBINE TECHNOLOGY FOR ARMY AIRCRAFT
H. DUE, Teledyne Industries Inc., *Toledo, Ohio* 43697 (DA0C4114; DAAJ02-72-C-0117)

The objective of this program is to define, through aerodynamic investigations of small, cooled, high-work, axial-flow turbine configurations, empirical correlations that will aid in the design of turbine components of increased performance and that will improve performance prediction techniques. This program will provide advanced turbine technology to meet the requirements of future engines for Army aircraft in less than the 5 lb/sec air flow class.

Design, fabricate, and test the necessary nozzle and rotor cascades, and single-stage axial-flow turbines to provide the empirical data necessary to accomplish the program objective. The program shall be conducted in five phases: (1) preliminary design, (2) turbine cascade investigation, (3) stage investigation, (4) design technique assessment, and (5) modification and test.

ADDENDA: Supporting Agency Address Is: AVSCOM Eustis Directorate, Air Mobility R&D Laboratory, Ft. Eustis, Va.23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0039, ANALYTICAL MODEL TO SIMULATE HELICOPTER TRANSMISSION
J. MCCOOL, S K F Industries Incorporated, *Norristown, Pennsylvania* 19406 (DA0K4524; DAAD05-74-C-0747)

To produce an analytical model capable of predicting steady-state dynamic and thermal performance of the transmission gears, bearings, shafts and casements concurrently under normal lubricated conditions, and predict the thermal transient and dynamic performance of the transmission following loss of primary lubrication. Incorporate means of automated evaluation of changes in configuration and materials.

Develop a power transmission analysis to obtain gear heat generation; extend model developed under DAADO 5-73-C-0011 to include flanged bearing applications; extend gear and bearing analyses to encompass planetary pinons; combine results to develop 2 shaft systems and compare with experimental results previously documented; extend analysis to planetary gearbox transient and steady-state models.

ADDENDA: Supporting Agency Address is: DARCOM Ballistic Research Labs., Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

1.0040, YUH-61A OPERATIONAL STATISTICS
S. BLEWITT, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0D3941; DAAJ02-74-C-0056)

This effort will develop verified simulation models of the Boeing Vertol Company's developmental utility tactical transport aircraft system (UTTAS) helicopter model YUH-61A in the Army's R&M and the more detailed aircraft reliability & maintainability simulation (ARMS) models, using first, inherent or design values of the R&M characteristics of the YUH-61A, and then extrapolating to the predicted R&M values of the mature aircraft system operating in and maintained by a typical Army Field Tactical Organization. The models, data and reports will be treated as 'competition-sensitive' during the period prior to selection of the UTTAS YUH-61A or Sikorsky YUH-60A production contractor.

This program will systematically develop five distinct models for use in UTTAS simulation analysis studies. They are, 1st: The Army's validated R&M simulation model of the USN operational twin-engined utility helicopter, the UH-1N, will be given to the contractor to be modified to the proposed UTTAS operational, support and maintenance scenarios to study the impact of the proposed O&M concepts on a well- known operational helicopter; 2nd: Design failure rates and a 'perfect' maintenance system; and 3rd: Mature failure rates and 'imperfect' diagnostic errors, incorrect repairs, etc., in the R&M model; and 4th and 5th: Design and mature versions of the ARMS model.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility Research and Development Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0041, BEARINGLESS TAIL ROTOR LOADS AND STABILITY, ARMY HELICOPTERS
W.T. EDWARDS, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0D3983; DAAJ02-75-C-0017)

To obtain the dynamic response characteristics of a bearingless tail rotor system to provide data for validation of tail rotor load and stability prediction methods. To determine the effects of configuration changes on loads and stability characteristics.

Prepare the wind-tunnel test data obtained by Vertol on the 0.8 scale UTTAS elastic pitch beam tail rotor in a format suitable for subsequent use in correlation with analytical predication methods. Conduct laboratory tests of the tail rotor components to determine actual inertial, geometric, and stiffness properties to assure that poor correlation does not occur due to inadequate knowledge of the experimental hardware when loads and stability are subsequently predicted.

ADDENDA: Supporting Agency Address is: AVSCOM EUSTIS Directorate, U.S. Army Air Mobility R&D Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0042, EVALUATION OF CONTRAST REDUCTION TECHNIQUES FOR ARMY AIRCRAFT
D.R. GUNDLING, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0D3948; DAAJ02-75-C-0001)

To determine the effectiveness of passive optical countermeasures developed under contract DAAJ02-73-C-0060 in reducing the visual detectability of AH-1G in nap-of-the-earth flight. Also to verify the applicability of the laboratory simulation used to predict detection ranges and probability in the previous contract.

Field tests will be conducted using a MASSTER camouflage pattern- painted AH-1G and an OH-13 with a flat-plate canopy and modified tail boom. Ground-based observers will be used to take detection range data.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility Research and Development Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0043, FINITE-ELEMENT ANALYSIS FOR COMPLEX STRUCTURES - ARMY HELICOPTERS
A.J. LEMANSKI, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0D4012; DAAJ02-75-C-0053)

To develop an analytical technique that has the capacity and flexibility for utilization on complex structures such as rotor hubs, and transmission housings. This technique shall determine the relationship of structural strength, stiffness, dynamic response and temperature effects on bearing wear, noise generation, fail-safety, and structural efficiency.

Develop or adapt a finite-element analysis method for use on existing helicopter transmission housing which considers housing stiffness, gear alignment, dynamic response, vibration and thermal characteristics. Design improvements to this transmission, fabricate experimental models, and conduct proof tests to evaluate the analysis and design improvements.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0044, VALIDATION OF ROTORCRAFT SIMULATION PROGRAM THROUGH CORRELATION WITH FLIGHT DATA ANALYSIS
J. STALEY, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0D3939; DAAJ02-74-C-0051)

The purpose of this program is to provide an independent evaluation of the C-81 rotorcraft simulation computer program written by Bell Helicopter Company (through the comparison of selected flight-test and full-scale rotor whirl stand-test data with that calculated by the C-81 rotorcraft analysis).

Boeing Vertol shall review and compile unrestricted flight test data for the BO-105 helicopter for comparison with analytical results to be obtained using the C-81 analysis. The contractor shall compile test data to exercise and compare the three major portions of the C-81, i.e., trim, stability and control, and maneuver. The major prediction effort shall be directed within the normal flight envelope of the subject helicopter with representative data points, approaching and on the flight boundaries.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility Research and Development Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0045, AIRFOIL SECTION DATA FOR HELICOPTER DESIGN
W.Z. STEPNIEWSKI, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0C3520; NAS2-8637)

The objectives of the contractual effort to develop Volume I, Airfoil Section Data for the Helicopter Design, DATCOM, are to compile, evaluate, and present the most reliable data and theoretical results for at least 35 selected airfoils which will be most typically used in helicopter rotor blade design.

The approach is to accomplish the following three phases: (1) data acquisition, evaluation, and analysis of airfoil information, (2) development of airfoil DATCOM, and (3) sample calculations to obtain airfoil section characteristics.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility R&D Laboratory, Headquarters, Ames Research Center, Moffett Field, Ca. 94035

SUPPORTED BY U.S. Dept. of Defense - Army

1.0046, CH-47 CRASH TEST
A. TANNER, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0D3851; DAAJ02-73-C-0067)

The objective of this program is to obtain technical data pertaining to the dynamic behavior of large troop/cargo-carrying helicopter structure and major components in the crash environment. Data will be used to develop design criteria which will improve crashworthiness characteristics of future Army aircraft, thus enhancing survivability and improving mission capability.

A crash-damaged CH-47C helicopter will be repaired by the contractor to the extent that major structure and high-mass components are representative of a flightworthy aircraft. Various seating systems will be installed and instrumentation to measure structural deflections will be mounted in critical areas. In a joint Army/NASA effort, the helicopter will be dynamically crash tested on the lunar lander facility at Langley Research Center. Data will be reduced and analyzed and a final report will be published. In addition to repairing the aircraft, Vertol will provide 600 man-hours of engineering to assist in pretest, test, and post-test activities.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility R&D Lab, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0047, ADVANCED-CONCEPT TRANSMISSION SYSTEM, ARMY HELICOPTERS
C.E. BRADDOCK, Bell Helicopter Company, *Fort Worth, Texas* 76101 (DA0D3986; DAAJ02-75-C-0024)

The purpose of this program is to formulate a conceptual design and a component development and test program for a helicopter transmission which could enter engineering development in the 1980-90 time frame.

A. Define the baseline contemporary helicopter drive system technology, to include weight, cost, survivability, reliability, and maintainability. B. Based on the above, determine the technology development requirements for each transmission component that must be considered to attain the objectives. C. Technical report containing the conceptual design and proposal for a component technology development and test program.

ADDENDA: Supporting Agency Address is: AVSCOM Eustis Directorate, U.S. Army Air Mobility Research and Development Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0048, BLAST EFFECTS ON IN-FLIGHT HELICOPTER (DICE THROW)
H. CONOLEY, Bell Helicopter Company, *Fort Worth, Texas* 76101 (DA0H4449; DAAJ01-71-A-0335)

To provide a helicopter with instrumentation and drone remote control system capability as required to meet the objectives of project LN-114 of the 'mixed company' blast trial to be conducted in October 1972.

Project LN-114 of the 'mixed company' blast trial will consist of flying a drone helicopter, fully instrumented, in a 500 ton TNT blast environment to measure the structural and rigid body responses. The government will provide the helicopter and the Bell Helicopter Company will provide the instrumentation and autopilot system.

ADDENDA: Supporting Agency Address is: DARCOM Ballistic Rsch. Labs., Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

1.0049, ROTOR FREQUENCY AND STABILITY ANALYSIS FOR THE ROTORCRAFT FLIGHT SIMULATION
T. MCCLARTY, Bell Helicopter Company, *Fort Worth, Texas* 76101 (DA0D3990; DAAJ02-75-C-0025)

To develop a rotor natural frequency and stability analysis for the rotorcraft flight simulation, computer program C-81.

A computer program will be provided to predict blade natural frequencies and mode shapes compatible with C-81. The C-81 program will be revised to improve rotor hub and blade dynamic representation. A survey shall be made of existing rotor stability analysis techniques. The method best suited for C-81 will be incorporated in the program and demonstrated for several cases for which simpler solutions are available and for full-scale aircraft.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0050, VARIABLE-CAMBER SYSTEM SUPERCRITICAL WING

R. MCANALLY, General Dynamics Corporation, *Fort Worth, Texas* 76101 (DF133480; F33615-75-C-3018)

Increasing emphasis on acquisition and operations cost reduction require the development of increasingly efficient Air Force flight vehicles. The overall strategic capabilities of the Air Force can be increased with improvements in the performance of these aircraft. The variable-camber supercritical wing (VCSCW) possesses outstanding potential for increasing the performance, reliability, and efficiency of advanced aircraft. However, this development of a viable structural and mechanical design for the flexible skin leading and trailing edges is a major effort required for the eventual incorporation of this concept into basic wing design technology.

This program is an analytical effort to develop several preliminary structural/mechanical designs for the flexible skin leading and trailing edges of a variable-camber supercritical wing. Preliminary analysis will include internal loads, mechanical linkages, aeroelastic weight and cost analysis. A preliminary plan and cost will be recommended for a program to complete the effort through testing.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FBS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0051, GROUND VIBRATION TESTING OF FIGHTER AIRCRAFT WITH ACTIVE CONTROL SYSTEMS

R.P. PELOUBET, General Dynamics Corporation, *Fort Worth, Texas* 76101 (DF136790; F33615-76-C-3063)

Aircraft with active control systems can encounter instabilities which result from the interaction of the control system with the structural or aeroelastic response if adequate control system compensations are not provided. The objective of this effort is to evaluate test procedures to be used in conjunction with ground vibration testing that account for the control system/airframe interaction and to correlate with analysis results. This effort will establish the confidence and reliability of the tests and analysis procedures. The ultimate payoff will be a reliable test and analysis procedure for preventing adverse control system/airframe interaction, thereby eliminating flight restrictions or costly modifications during flight test.

Closed-loop tests and analyses will be conducted on the YF-16. Tests will be conducted while the aircraft is mounted on soft supports using different types and levels of excitation. Results of these tests will be compared with previous ground resonance test results with the aircraft on its gear. Analyses will be conducted and correlated with the test results.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FBRC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0052, COMBUSTOR DESIGN FUNDAMENTALS

J. SWITHENBANK, Univ. of Sheffield, *Sheffield, England, United Kingdom* (DF013410; AF-AFOSR-2682-74)

AF function - advanced air-breathing engines, airborne weapon delivery. Deficiency - insufficient understanding of basic mechanisms and processes involved in advanced air-breathing combustors and lack of realistic guidelines for predicting propulsion system performance and solution of combustor design problems. Objectives - to understand and develop accurate theoretical and mathematical models realistically describing the combustion phenomena encountered in advanced air- breathing ramjet and turbojet combustors and augmentors. How work contributes - will provide additional understanding and realistic analytical modeling of turbulent reactive flow fields not now available and will contribute to establishing realistic design criteria for efficient, stable and low-polluting primary and secondary jet engine combustors. Also will aid in understanding combustion system limitations and hence in system optimization at design stages.

Parallel theoretical and experimental studies associated with modeling of ramjet and gas turbine combustors will be carried out. Emphasis will be on practical application of entrainment and turbulence theory and use of partially stirred chemical reactor theory to formulate phenomenological models for use in solution of combustor design problems. Included will be study of simultaneous influence of pressure, turbulence, unmixedness, multiple-reaction chemical kinetics, fuel preparation (e.g., droplet breakup, distribution and evaporation), steady and unsteady combustion in turbulent subsonic and supersonic air flows on combustor characteristics and performance. Theoretical model predictions will be verified experimentally using gas analyses, laser- diffraction droplet size and turbulent density spectrum analyses and quantitative turbulent mixing analyses on subsonic and supersonic combustors.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0053, DESIGN CRITERIA FOR ELASTOMERIC BEARINGS FOR HELICOPTER ROTOR AND CONTROL SYSTEMS

A. THOMPSON, Thiokol Chemical Corporation, *Brigham City, Utah* 84302 (DA0D3879; DAAJ02-73-C-0091)

The technical objective of this program is the creation of a comprehensive design manual for elastomeric bearings. The effort includes analytical investigations/developments and tests necessary to define characteristics of the bearings.

Investigations concerning analytical procedures, bearing geometries, test specimen geometries and bearing performance prediction will be conducted. Simultaneously, a materials characterization program will be executed to assure representative materials are selected. Tests of the simple specimens will establish analytical predictions concerning failure initiation and propagation. Tests of full-size complex bearings will verify the analytical predictions and procedures. Computer programs will be investigated for applicability in evaluating bearing geometries and loads, and modified as necessary to provide a suitable program for elastomeric bearing analyses. Design and test data accumulated will be evaluated and complied into the design manual.

ADDENDA: Supporting Agency Address Is: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate. Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0054, PROGRAM MANAGEMENT FORMULATION FOR TRANSITION TO ADVANCED DEVELOPMENT OF AIRCRAFT STRUCTURES

A.P. URBAN, Telcom Incorporated, *Arlington, Virginia* 22204 (DN590161; N00019-76-C-0501)

Economic benefit evaluation of introducing advanced composite aircraft structures into service use.

Analysis of options available for transition of composites to advanced development and production use versus cost of transition effort.

ADDENDA: Supporting Agency Address is: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0055, STRUCTURES TECHNOLOGY

J.L. SHIPLEY, U.S. Natl. Aero. & Space Adm., Langley Research Center, *Hampton, Virginia* 23665 (DA0E3552)

To investigate helicopter rotor aeroelastic effects, resulting dynamic loading and vibration, maneuvering loads, and to develop analytical techniques for predicting these effects in existing and future Army aircraft. This technology is necessary to preclude the occurrence of these instabilities in flight regimes required of rotorcraft to enhance the safety, survivability, and mission effectiveness. In addition, design criteria will be developed and concepts tested which enhance rotorcraft capability without incurring dynamic limitations.

Analytical and wind-tunnel investigations will be conducted of dynamically scaled bearingless and variable-geometry rotors. Aeroelastic and dynamic stability investigations will be conducted to establish parameters affecting these boundaries, to develop and verify aeroelastic stability analysis, and to develop rotor math modeling capability with minimum structural mathematics sim-

plification. Vacuum-chamber tests will be initiated on a full-scale rotor blade for verification of math model dynamics.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility R and D Laboratory, Langley Directorate, Mail Stop 266 NASA-LRC, Hampton, Va. 23665

SUPPORTED BY U.S. Dept. of Defense - Army

1.0056, HT AM 75-2 - CONVERSION OF ROTORCRAFT FLIGHT SIMULATION COMPUTER PROGRAM (C-81), INPUT DECKS TO NEW VERSION
E.E. AUSTIN, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3956)

To convert all available existing input data decks to the input format for the most recent version of the rotorcraft flight simulation computer program (C-81).

All existing input data decks for C-81 will be converted to the format of the new version of C-81. Speed sweeps will be run for each aircraft configuration. Trim variables and power will be plotted for each aircraft and included in a permanent file of listings and notes on each deck operational on the new version of the program.

ADDENDA: Supporting Agency Address is: AVSCOM Eustis Directorate, Air Mobility R and D Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0057, HT PP 74-51 - MINI REMOTELY PILOTED VEHICLES (RPV)
E.H. DEAN, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3977)

The technical objective is to conduct exploratory development of propulsion systems for remotely piloted vehicles (RPV). Effort will encompass the complete RPV propulsion system, including individual components (engines, propellers, etc.) and propulsion system installation investigations. Design, fabrication, and validation testing of engines, engine components, and other propulsion system components will be conducted.

The approach will be to identify and catalogue potential RPV propulsion systems in the 1-50 HP class, identify propulsion problems encountered with previous mini-RPV programs, formulate and initiate an exploratory development program with the objective of providing a reliable RPV propulsion system, conduct investigations leading to validation and selection of potential mini-RPV propulsion systems, and formulate test programs geared towards validating propulsion system performance.

ADDENDA: Supporting Agency Address is: AVSCOM Eustis Directorate, Air Mobility R and D Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0058, HT 69-2 - BALLISTIC RANGE OPERATION & GENERAL MAINTENANCE
E.M. PARD, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0B4016)

To operate, maintain, and provide instrumentation to support the ballistic testing of experimentally designed and fabricated concepts that are intended to increase the survivability of Army aircraft.

Provide continuous ballistic/instrumentation support for in-house and contractural efforts. Ballistic support is provided in conjunction with developing, testing, and evaluating experimental materials and systems that increase the survivability of Army aircrews and aircraft.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0059, HT PP 74-12 - ASSESSMENT OF ENERGY CRISIS IMPACT ON AIRCRAFT GAS TURBINES
K.F. SMITH, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3898)

To conduct in-house review of avaible current information pertaining to types of fuels which will be available for air mobile systems for the 1980 - 2000 time frame and define turbine engine/component R and D necessary to minimize impact of limited availability of fuels.

(1) Coordinate with appropriate Army agencies to define the Army air mobile fuel policy for 1980 - 2000 time frame to identify available primary, alternate and emergency fuels, (2) formulate plans and initiate combustor R and D efforts which will define combustor operating limitations associated with operation over a wide viscosity range utilizing hydrocarbon fuels.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility R and D Lab., Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0060, HT AM 74-4 - STABILITY AND CONTROL ANALYSIS OF CONVENTIONAL AND ADVANCED ROTORCRAFT SYSTEMS
G.T. WHITE, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3882)

Evaluate and compare the stability and control characteristics as predicted by several rotorcraft math models for single and tandem rotor systems. The influence of rotor-to-rotor interference and the treatment of rotor wake will be explored. The results of this investigation should prove relevant toward advancing the in-house capability to more accurately evaluate rotorcraft stability.

Available contractor stability data and flight-test response time histories on several of the helicopters in the Army inventory will be secured. Input data decks will be compiled and run for stability analysis from the C-81 (with and without wake tables), the MOSTAB-C, the CSMP, and if time permits, the Wake Geometry and Blade Loads Program. Evaluation of the output should reveal the relative accuracy of the programs and the influence of rotor wakes in stability analyses.

ADDENDA: Supporting Agency Address is: AVSCOM Air Mobility R and D Lab., Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0061, INVESTIGATION OF THREE-DIMENSIONAL FLOW SEPARATION ON FUSELAGE CONFIGURATIONS - ARMY HELICOPTERS
F.A. DVORAK, Analytical Methods Inc., *Bellevue, Washington* 98004 (DA0D4015; DAAJ02-75-C-0036)

Determine criteria for predicting three-dimensional flow separation on helicopter fuselages and develop design methodology to minimize flow separation. Overall objective is to reduce helicopter parasite drag. Benefits to helicopters that accrued from parasite drag reduction are increased endurance, vibration, stress, productivity and operation envelope.

Apply existing three-dimensional boundary-layer analysis to the problem of three-dimensional flow separation on a helicopter fuselage. The analysis will be modified so that it is compatible with the potential flow analysis at the Directorate. The boundary-layer analysis will include a means of analyzing the effects of blowing and sucking. Test data such as that of the BO-105 will be used to provide correlation with separation criteria used in the boundary-layer analysis. Design methodology will be developed for reducing separation on helicopter fuselages.

ADDENDA: Supporting Agency Address is: AVSCOM Eustis Directorate, Air Mobility Research and Development Lab., Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, SATELLITE NAVIGATION -- AIRBORNE ANTENNA SYSTEM
E. BEANE, U.S. Army, Electronics Command, *Red Bank, New Jersey* 07703 (DA0C3412)

Investigation of the use of the navigation satellite time and range global system (NAVSTAR GPS) with Army rotary-winged aircraft. Specific areas to be investigated are degradation of satellite signal by rotor blade modulation and multipath effects, and cost-effective hybrid augmentation schemes using GPS/Army User Equipment (AUE) with other navigation sensors. This program is coordinated with the NAVSTAR GPS Development Program managed by a tri-service Joint Program Office (JPO) to avoid duplication of effort.

Antenna systems will be developed and comparatively evaluated through the analysis and testing of various antenna structures with respect to location on aircraft and signal degradation. Study of past and current hybrid satellite navigation investigations and related technical literature; develop GPS receiver/system error models, dynamic aircraft flightpath computer simulations, implement optimal and suboptimal Kalman filter mechanizations for GPS augmented with other systems such as inertial, inertial strapdown, and Doppler- test proposed promising schemes in dynamic simulations, laboratory and flight tests; develop an in-house GPS receiver digital computer modeling capability as a primary evaluation tool for the performance analysis of proposed GPS receiver designs and hybrid system configurations; investigate, develop, and optimize UTM coordinate transformation algorithms with regard to software complexity, processing time, accuracy, power consumption, cost, size, and weight.

ADDENDA: Supporting Agency Address is: ECOM Avionics Lab. AMSEL- VL-D, Ft. Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

2.0002, SPACE VEHICLE CONTROL SYSTEM
P.W. LIKINS, Columbia University, Graduate School, *New York, New York* 10027 (NAS 8-32212)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, MEAN FLOW/ACOUSTIC INTERACTIONS & STATISTICAL ANALYSIS OF STEADY-STATE COMBUSTION OF NONMETALLIZED COMPOSITE SOLID PROPELLANTS
R.L. GLICK, Thiokol Chemical Corporation, *Huntsville, Alabama* (DF039460; F44620-74-C-0080)

This effort supports RO 5.1 in an examination of steady-state combustion phenomena in solid rocket propellants. Recent advancements in steady-state, composite propellant combustion modeling have been made by assuming that the topography of the burning surface is a fuel plain dotted with concave and/or convex oxidizer surfaces and the macroscopic flame structure is an ensemble of non-interacting, quasi-one-dimensional flames. By describing the flames with the BDP model and employing statistical concepts, combustion models for non-metallized propellants with polydisperse spherical oxidizer have been developed. Major difficulties with this model are believed to be associated with aspheric oxidizer, interacting flames, binder and oxidizer melts (the BDP model treats oxidizer melts implicitly), and non-planar burning surface. This research is directed at inclusion of aspheric oxidizer and ingredient melt effects within the framework of the current model and at basic research on the statistics of polydisperse particulate packings. The latter is a basic stumbling block in the inclusion of flame interactions and 'rough burning surface' effects in statistical combustion modeling. A substudy is directed at investigating mean flow/acoustic interactions in solid-propellant rocket motors with the hydraulic analogy.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0002, NEW PERFLUOROPOLYMER-FORMING REACTIONS
M.S. TOY, Science Applications Inc., *La Jolla, California* 92037 (DF042390; F44620-76-C-0027)

Technical objective - new and improved thermally stable elastomers are needed as containment materials such as fuel tank and hydraulic system seals, expulsion bladders, etc., for advanced aircraft, aerospace and missile systems. The objective of this research is to study the nature of O-F bond dissociations and additions to unsaturated perfluorocarbon bonds and to demonstrate polymer-forming reactions that can be utilized to synthesize perfluoropolymers with elastomeric properties over a broad temperature range. Approach - the research will study the dissociation of the covalent O-F bond by homolytic and heterolytic cleavages and the nature of addition of the O-F bond to unsaturated perfluorocarbon bonds from perfluoroolefins, perfluorodienes, perfluoroaromatics, and perfluoroheterocyclics under free radical, anionic, and cationic environments. The study will include new perfluoropolymer-forming reactions identified in the research involving reactions of primary and tertiary mono- and di- fluoroxyperfluoroalkanes and primary and tertiary perfluorodialkyl peroxides with mono- and di-perfluoroolefins, perfluoroaromatics, and perfluoroheterocyclics.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NC, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0003, NEW CONCEPTS IN COMPOSITE-MATERIAL LANDING GEAR FOR MILITARY AIRCRAFT (CONCEPTS/CRITERIA)
V.L. WILSON, Rockwell International Corp., *Los Angeles, California* 90009 (DF136220; F33615-76-C-3021)

Fatigue and corrosion are a major cause of metallic landing gear hardware failure resulting in high landing gear life-cycle costs. The objective of this work unit is to extend the AFFDL-developed technology in composite-material landing gear hardware to the conceptual design study of complete composite-material landing gear systems. This study will establish the cost- and weight-saving benefits that are possible through the maximum practical use of composite-material landing gear hardware in complete landing gear systems. Composite material has excellent potential to save up to 40 percent weight for some landing gear hardware components and to extend the useful life of the gear due to its excellent corrosion and fatigue properties.

The work to be done will be based on the design requirements and constraints established for a current Air Force aircraft landing gear system. Using these parameters and the AFFDL developed technology in composite-material landing gear, complete new landing gear designs will be developed which make maximum practical use of composite-material landing gear hardware. Initial acquisition and life-cycle cost benefits and weight-savings benefits will then be established and comparisons made to the conventional metallic landing gear.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0004, HIGH-TEMPERATURE DEFORMATION IN DISPERSION-STRENGTHENED METALS
W.D. NIX, Stanford University, School of Engineering, *Palo Alto, California* 94305 (DF035590; AF-AFOSR-2434-73)

The demanding requirements of high-performance aerospace vehicles make clear the need for materials with mechanical properties yielding superior performance and extended life. Dispersion-strengthened metals and alloys are being used in the hottest sections of some high- performance gas turbine engines and their use is expected to become even more widespread in aerospace systems of the future. Thus, the phenomenon of dispersion strengthening is of considerable technological importance. The objective of this research is to obtain an understanding of the mechanisms that control high-temperature deformation in metal single crystals containing non-deformable particles in the hope that such information will aid in understanding the complex mechanical behavior of commercial, polycrystalline, dispersion-strengthened alloys. The present

limited understanding of high-temperature dispersion strengthening is based on theories which deal with the effects of particles on single- crystalline matrices, while all experiments are on polycrystalline samples where grain boundary sliding and fracture are dominant. The additional presence of grain boundary effects in the experimental data has also confused the situation. To avoid the confusion and to better understand the mechanisms involved, the principal investigator is undertaking a study of high-temperature dispersion strengthening of single crystals.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NE, Bldg 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0005, ASYMPTOTIC APPROACH TO IGNITION MODELING 10701-E

F.A. WILLIAMS, Univ. of California, School of Engineering, *San Diego, California* 92038 (DA0D9075; DA-ARO(D)-31-124-73-G108)

To perform a theoretical study of the ignition of solid propellants. Ignition processes are important in many military applications. These include interior ballistics where ignition time affects gun barrel pressures and projectile muzzle velocity. The Missile Command notes that a correct model of ignition is of immediate need to the technical services. Picatinny Arsenal is carrying out an experimental program which may benefit from this theoretical study. Frankford Arsenal states, 'This work work is directly relevant to tasks in ignition of propellants and combustion of propellants that are currently in progress at this installation.'

Ignition by condensed-phase reactions, by heterogeneous reactions and by gas-phase reactions will be considered. Ignition in these reactions will be approximated as a one-step Arrhenius process. The method of matched asymptotic analysis will be employed and a full range of variables of physical significance will be covered. These results will be amenable to comparison with experimental results for the purpose of determining sites of ignition reaction and the consequent kinetic parameters.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, P.O. Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

3.0006, LATTICE DYNAMICS IN NITRAMINES

T.B. BRILL, Univ. of Delaware, School of Arts & Sciences, *Newark, Delaware* 19711 (DF044710; AF-AFOSR-3055-76)

AF function - many future rocket propulsion systems will utilize nitramine propellants such as HMX. Deficiency - HMX is a complex organic molecule. The mechanisms of thermal decomposition of the molecule, the initial step in its combustion, are not understood. Objective - this research will determine the thermal decomposition mechanisms of alpha-, beta-, and delta-phase HMX. How work contributes - the understanding gained from this work will permit the formulation of safer high-energy rocket propellants.

The molecular and lattice vibrational motions in crystalline nitramine propellants, particularly HMX, are to be studied by laser raman spectroscopy. The crystalline polymorphs will be prepared and their spectra compared to theoretical predictions from factor group analyses. Spectral correlations with the known structural parameters in the alpha, beta and delta forms will be made with the ultimate intent of following the temperature dependence of the molecular and lattice motions as HMX heats toward thermal decomposition. It is intended that a more clear picture of the fundamental events occurring in the condensed phase of HMX can be gleaned from these studies.

ADDENDA: Supporting Agency Address is: AF office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0007, ANALYSIS AND DESIGN OF COMPOSITE BONDED JOINTS UNDER A DYNAMIC TYPE LOAD

J.R. VINSON, Univ. of Delaware, School of Engineering, *Newark, Delaware* 19711 (DF027060; AF-AFOSR-2739-74)

AF function - advanced aerospace vehicle designs require improved structural efficiency to meet mission objectives and improved durability to reduce Air Force ownership costs. Opportunity - advanced composite materials for primary structure and adhesive bonding represent significant new opportunities to enhance air force structures in functions indicated above. Objective - the objective of this research is to experimentally study the fatigue behavior of composite adhesively bonded joints and identify the failure mechanisms and governing parameters. How work contributes - this research contributes to the technology base associated with composite structural development for aerospace vehicles.

The approach being followed by this research is primarily experimental. Single lap joints of graphite epoxy will be statically and fatigue tested. Tests will include environmental exposure to both moisture and temperature in order to study degradation of both composite adherends and adhesive. In particular, changes in failure mechanisms which can occur as a result of environment will be sought. Load- frequency effects will also be studied through experimentation.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0008, MOLECULAR CHEMISTRY OF INHIBITED COMBUSTION SYSTEMS 13944-CX

J.W. HASTIE, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20324 (DA0E9036)

To study flame-inhibition mechanisms at molecular level. Emphasis will be given to the class of inhibitors where bromine is the active component. The research is relevant to work on 'fire-safe fuels.' Fuels with reduced flammability are needed for use in aircraft and armored vehicles. An improved fundamental understanding of the flame-inhibition mechanism may lead to the development of a fuel additive to prevent fuel fires and control explosion hazards of fuel storage areas.

The experimental approach will involve the application of state-of- the-art molecular beam high-pressure mass spectrometric techniques, together with optical spectroscopy, for the kinetic characterization of inhibited flames. A theoretical description of these flames will be made and compared to experimentally obtained properties.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

3.0009, THE BEHAVIOR OF ALUMINUM IN COMBUSTION OF SOLID ROCKET PROPELLANTS

E.W. PRICE, Georgia Inst. of Technology, School of Aerospace Engin., *Atlanta, Georgia* 30332 (DF042200; AF-AFOSR-2912-76)

A critical problem still facing the Air Force is the accurate prediction of burn rates in rocket propellants which contain aluminum. The combustion of the aluminum, itself, is a key issue. This effort will study several aspects of aluminum combustion including (a) preignition behavior where samples are subjected to externally induced heating in controlled atmosphere, (b) the behavior of aluminum in AP/AL systems using packed formulations, (c) localized introduction of diffusion flame through geometrically controlled introduction of binder, (d) extension of the localized diffusion flame approach using a cylindrical tube of binder, and (e) the effect of gas flow on the aluminum combustion.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0010, SOLID PROPELLANT FIRE ENVIRONMENTAL STUDY

E.W. PRICE, Georgia Inst. of Technology, School of Aerospace Engin., *Atlanta, Georgia* 30332 (DF186760; F29601-76-C-0119)

The objective of this effort is to generate techniques, and/or equipment to measure controlling reactions, measure heat transfer properties, and sample hot gases of the combustion zone of burning UTP 3001 solid propellant.

In-depth literature surveys of potential experimental techniques will be evaluated; particular emphasis will be placed on adapting techniques from other fields (reentry testing) dealing with high- temperature environments. On-line mass spectroscopic techniques will be studied for potential combustion-zone component analysis.

ADDENDA: Supporting Agency Address is: AF Weapons Laboratory NSQ, Kirtland AFB, N. Mex. 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0011, OPTICAL SURFACE STUDIES OF TITANIUM AND TI-AL ALLOYS WITH APPLICATION TO MECHANISM OF PASSIVITY & NON-DESTRUCTIVE TESTING

J.R. STEVENSON, Georgia Inst. of Technology, School of Physics, *Atlanta*, *Georgia* 30332 (DF040080; AF-AFOSR-2773-75)

AF function - the Air Force is vitally interested in reducing costs and increasing reliability of mechanical and electronic systems exposed to the hostile environment of the atmosphere. Oxidation and corrosion of metals and alloys continues to be a major factor in operating and maintaining (O and M) aircraft systems. Opportunity - of all of the recent techniques to examine surfaces of solids, the use of synchrotron radiation spectroscopy provides the most sensitive and specific information about the atoms/ions and electrons on solid surfaces. Objective - this research will utilize an electron storage ring as a source of polarized electromagnetic radiation in the UV to IR region to study the surface stability of aerospace metals. How work contributes - this is a potentially new non-destructive evaluation (NDE) technique for general corrosion problems on aircraft structures.

Ellipsometric techniques and Auger spectroscopy will be used to monitor the chemical characteristics of the surface. Controlled atmospheres of oxygen and nitrogen will be used to produce well-defined changes in surface characteristics. The effects of these changes on the optical constants, Auger spectrum, and secondary electron emission ratio will be determined.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NE, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0012, ENVIRONMENTAL EXPOSURE EFFECTS ON COMPOSITE MATERIALS

L.J. BROUTMAN, Illinois Inst. of Technology, School of Engineering, *Chicago*, *Illinois* 60616 (DF033110; AF-AFOSR-2214-72)

Air force function - Air Force flight vehicles are continuing to require new designs which offer performance increases, higher design life reliability and improved maintainability. Advanced structural composites is a material system under development to meet these requirements. Deficiency - in utilizing composites in primary structure the behavior of the structure must be well characterized under all anticipated environmental conditions. Conditions of elevated temperature and high moisture content have recently been demonstrated to cause significant reductions in strength and stiffness of this material. No fundamental understanding of this phenomenon is currently available. Objective - the objective of this research is to develop a basic understanding of the environmental effects of moisture and temperature on composite strength. How contributes - this research effort will assist advance development programs in seeking near-term engineering solutions to application-oriented efforts and provide a firm basis for mid-term and long-term R and D efforts.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0013, VARIANCE IN FATIGUE CRACK PROPAGATION

B.M. HILLBERRY, Purdue University, Purdue Research Foundation, *Lafayette*, *Indiana* 47907 (DF138680; AF-AFOSR-3018-76)

The accuracy of crack life predictions required by USAF MIL-A-83444 depends on the accuracy of the constant-amplitude crack growth rate data on which they, the predictions, are based. The objective of this effort is to relate the variance in fatigue crack growth rates to the variance in crack growth lives and thereby determine the accuracy required in describing constant-amplitude fatigue crack growth rates. The return on this investment will be more accurate crack growth life prediction capability that can be utilized to establish aircraft structural safety and durability.

Constant-amplitude fatigue crack growth rate data provide the analyst with the necessary baseline data for predicting crack growth lives. These baseline data are generated by numerical differentiation of discrete experimental crack length vs. cycles data points. This effort employs a systematic procedure for evaluating the variance in crack growth rate data due to (a) point-to-point material differences, (b) numerical differentiation techniques, and (c) crack length vs. cycle data collection techniques. Unless the variance due to each of these factors is evaluated, it is not possible to discern from the crack growth rate data potential variations in crack growth lives.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FBEC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0014, HEAT-STABLE POLYMERS- POLYPHENYLENES AND OTHER AROMATIC POLYMERS 11754-C

J.K. STILLE, Univ. of Iowa, School of Liberal Arts, *Iowa City*, *Iowa* 52240 (DA0D9200; DAAG29 74 G0023)

As an approach to the preparation of processible polymers with superior heat stability, efforts will be directed to the synthesis of polyphenylenes, ladder polyaromatic hydrocarbons, and oligomeric phenylenes which can be subsequently crosslinked or further polymerized. Polyphenylenes of M-catenation and P-catenation structures will be compared. Polymers of the type proposed are in demand for possible application in fuse development, electrical insulation, lightweight gun tubes, high-temperature-resistant coatings, and ablative materials for missile nose cones and rocket nozzles.

Among the preparative processes to be explored will be Diels-Alder reactions, and nucleophilic displacement reactions of aryl chromium carbonyl complexes. The products will be studied with regard to relationships between their molecular structure and their physical properties, including thermal stability, crystallinity, transition temperatures, molecular weight, and solubility.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office Research, Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

3.0015, DEVELOPMENT OF HOLOGRAPHIC RECORDING MATERIALS

A.A. FRIESEM, Weizmann Institute of Science, *Rehovot*, *Israel* (DF138660; AF-AFOSR-3004-76)

Photoplastics and photodielectric polymers exhibit a high potential as efficient, low-cost recording materials for holography. Development work is required, however, before these materials can be utilized. In this effort, recording materials needed to facilitate making real-time holograms will be developed. This will provide improved techniques for performing nondestructive inspection of aircraft to determine structural integrity.

Photoplastics and photodielectric polymers will be used and evaluated in holographic tests representing typical real-time recording arrangements.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FBE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0016, DYNAMIC BEHAVIOR, STRENGTH AND FATIGUE OF COMPOSITES
Z. HASHIN, Tel Aviv University, *Tel Aviv, Israel* (DF037610; AF-AFOSR-2591-74)

Advance high-performance aerospace vehicles will continue to be developed with emphasis placed on life assurance, cost and increased performance capability. The use of composite materials in primary structural design is under extensive development in order to exploit this materials potential in Air Force vehicle design. This research effort will investigate the stress concentration effects, damping, static and fatigue failure modes in composite materials in conjunction with formulating optimal design criteria. The objective then is to develop a basic understanding of structural behavior in terms of composite material tailored to meet specific design requirements which is based upon a life assurance/wear-out concept. This objective will be pursued theoretically for the most part during this period of research with heavy reliance on previous experimental investigations.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0017, EFFECT OF STRUCTURE ON PHYSICAL POLYMER INTERACTIONS AND PROPERTIES
F.E. KARASZ, Univ. of Massachusetts, School of Engineering, *Amherst, Massachusetts* 01002 (DF043340; AF-AFOSR-2983-76)

AF function - advanced aircraft employ structural materials, seals and adhesives which require superior performance characteristics over a broad range of temperature and environmental conditions. Deficiency - new high-temperature polymer systems are difficult to process and the effects of processibility on properties and life expectancy for these applications are not understood. Objective - this research is to study how molecular structure and morphology on a supermolecular scale govern polymeric interactions and the resultant physical and mechanical properties. How work contributes - it is expected that this research will generate information for the processing of intractable, high- temperature resin systems and the design of mechanisms to overcome the polymeric degradation due to temperature-humidity effects.

Polymer physical chemistry will center on (1) development of the specific principles for predicting compatibility and alloying in multi- component polymer systems, (2) assessment of the interaction at molecular levels of water and other solvents with solid polymers as a function of the composition of the macromolecule, and (3) study of the effect of high pressure on the morphology, low-temperature relaxation and mechanical engineering properties of crystalline polymers and the dynamical mechanical properties of amorphous and semi-crystalline polymers.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NC, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0018, EARLY STAGES OF OXIDATION OF METAL SURFACES - EXPERIMENT PROPOSED FOR THE MOLECULAR BEAM APPARATUS OF THE SHUTTLE PROGRAM
H.C. GATOS, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 1337)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0019, AIRCRAFT LUBRICANT VISCOSITIES AT HIGH PRESSURE
B. NEWHALL, Harwood Engineering Co. Inc., *Walpole, Massachusetts* (DF459370; F33615-76-C-2053)

Develop the capability for measuring lubricant viscosities in the pressure and temperature range of interest in engine applications (200- 300 Kpsi, 300-400 degrees F) and the viscosity range of importance to viscoelastic effects (100,000 centipoise and above).

Design and construct high-pressure viscometer cell for extreme pressures and modify existing measurement techniques to allow measurement of desired viscosities in a reasonable time period. Demonstrate equipment capability by conducting viscosity measurements on 2 fluids at critical pressures.

ADDENDA: Supporting Agency Address is: AF Aero-Propulsion Laboratory SFL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0020, PHASE STABILITY IN HIGH-TEMPERATURE NICKEL & TI ALLOYS FOR USE IN GAS TURBINE ENGINES
R.D. FRENCH, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0C4817)

To study phase stability in high-temperature nickel and titanium alloys. In particular this project will (a) reduce ductility scatter in cast nickel-base alloys by controlling the microstructure through thermal cycling and (b) extend the development of high-temperature titanium alloys through improvement of strength and creep resistance to 1200F. It is expected that this project will establish phase stability in the alloy systems studied for periods of time comparable to anticipated service life. Project thrust is air defense.

The first task in this project is examining the role of secondary phases in strengthening nickel-base superalloys. Thermal treatments have been developed which reduce ductility scatter in cast alloy 713C and increase the average ductility of commercial material by approximately 50 percent. The treatments are being refined as a commercial process by gaining an understanding of secondary phase reaction kinetics. The second task is an attempt to stabilize the development of aluminide precipitates in high-aluminum-content titanium alloys. Beta stabilizing elements have been added to improve workability and reduce the total amount of aluminides.

ADDENDA: Supporting Agency Address is: DARCOM Materials and Mechanics Research Center, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0021, POLYMERIZATION AND DEGRADATION BEHAVIOR OF NEW POLYMERIC MATERIALS
G.L. HAGNAUER, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0B4776)

To investigate and obtain information on the effects of polymerization, processing, and extreme environmental conditions on the molecular structure and properties of new polymeric materials for special Army applications as fuel-resistant, low-temperature elastomers, flame retardants, and transparent armor materials. This work will also provide information on structure-property relations of new synthetic or commercial polymers needed to guide applications and to indicate potential for property improvements. Major thrusts - mobile and all- weather air defense, aircraft survivability, deterioration.

The polymerization kinetics of poly(dichlorophosphazene) will be investigated. Special efforts will be made to increase polymer yields and to gain control of polymer structure by modification of polymerization conditions. The degradation behavior and effects of cure conditions and stabilizing agents on the molecular structure and properties of several substituted polyphosphazenes will be determined and compared with polymer materials in current use. The polymerization kinetics and influence of processing conditions on the structure- property relations of certain polyquinoxaline and triazine polymers will also be investigated. Special dilute solution techniques will be used to analyze molecular weights, distributions, polymer chain dimensions, branching, and cross-linking and to fractionate polymers for structure- property studies.

ADDENDA: Supporting Agency Address is: DARCOM Materials and Mechanics Research Center, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0022, STRUCTURAL PROPERTIES OF BALLISTICALLY TOLERANT MATERIALS
J. PLUMER, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0E4774)

Current aircraft fuselage construction, a shim supported by stringers and frames, is inadequate under foreseeable threats of mid- intensity warfare, such as 23mm HEI shells, SA-F missiles and high- energy lasers, each with the capability of destroying substantial portions of this construction with a single hit. The project objective is the assessment and development of damage tolerance of composite panel materials suitable for a monocoque fuselage construction. High- explosive-generated structural damage is greatly reduced in this design as all aerodynamic loads are carried in the skin, plus monocoque construction avoids the thin-skin's susceptibility to rapid laser burn- through.

Panel sections will be fabricated in various designs embodying combinations of fiber-reinforced skin and core materials in selected configurations. These panels will be subjected to damage by projectiles, by high-explosive shell and by high-intensity radiation. The nature of damage will be determined and degradation of structural properties measured. Through analysis of test data, design criteria for composite panel materials tolerant of such damage will be established. Radar- return characteristics of the materials will also be determined.

ADDENDA: Supporting Agency Address is: DARCOM Materials and Mechanics Research Center, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0023, THE CONTRIBUTION OF DEFORMATION MARTENSITE TO THE MECHANICAL PROPERTIES OF METALS
L.A. SHEPARD, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0D4759)

The quenched body centered cubic copper alloy containing 14 wt. percent aluminum and 3 wt. percent nickel demonstrates an approximate 20 percent pseudoelastic strain at room temperature. Eight to 10 percent results from a martensitic transformation and an additional 10 percent by twinning of the martensite. In this continuing program, further important properties of this unusual alloy will be examined in single- crystal and polycrystalline form.

(1) Fatigue testing of single crystals will be expanded to examine properties over a range of temperatures and large initial strains (cycling above zero mean stress). (2) The unusual potential for mechanical energy storage in single crystals of this alloy, and energy release at higher temperatures will be examined. (3) Orientations most suitable for torsion spring applications will be studied. (4) Low- temperature energy conversion properties of this alloy will be investigated.

ADDENDA: Supporting Agency Address is: DARCOM Materials and Mechanics Research Center, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0024, STRUCTURAL MATERIALS WITH DAMPING CHARACTERISTICS
R.J. WEISS, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0D4751)

(A) To investigate the fundamental atomic mechanism of vibrational damping in such materials as nitinol (TiNi), Cu3Al, MnCu and Fe3Pt in order to be able to predict other systems that might show damping characteristics. (B) To produce a viable structural alloy with high damping for use in reducing helicopter transmission noise.

Simultaneous physical properties such as specific heat, resistivity, elastic constants, soft vibrational modes, and optical properties will be measured as a function of temperature and correlated to the damping. The effect of metallurgical treatment on the strength and damping will be examined.

ADDENDA: Supporting Agency Address is: DARCOM Materials and Mechanics Research Center, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0025, FRETTING FATIGUE AND CORROSION FATIGUE OF METALLIC MATERIALS 12626-MS
D.W. HOEPPNER, Univ. of Missouri, Graduate School, *Columbia, Missouri* 65202 (DA0F5577; DAAG29 75 G0127)

To discover the fundamental mechanisms of fretting fatigue and corrosion fatigue in single crystals of iron, nickel, and aluminum under various fretting and corrosion conditions. Relevance - failures due to fretting corrosion, corrosion fatigue, and complicated combinations of these have been encountered in components of Army helicopters and engines. The proposed research is directly relevant to such phenomena.

The environments to be examined in corrosion-fatigue and in fretting-corrosion-fatigue include, but will not be restricted to, both gaseous and aqueous media. Other variables to be examined are crystallographic orientation, applied cyclic stress, applied normal load and the material of the fretting couple. The nature of the physical and chemical processes involved in fretting fatigue and corrosion fatigue will be elucidated in order to be able to model the behavior of polycrystals of the same materials under similar conditions. Of special interest are determinations of the kinetics of the failure mechanisms involved.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office Research, Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

3.0026, THE RELATION BETWEEN THE CHEMICAL AND PHYSICAL STRUCTURE AND THE MECHANICAL RESPONSE OF POLYMERS
R.P. MORGAN, McDonnell Douglas Astro. Corp., *St. Louis, Missouri* 63166 (DF043420; F44620-76-C-0075)

AF function - advanced aircraft utilize structural components in the form of matrices for composite materials, adhesives and transparencies which are subjected to extreme service environments. Deficiency - a basic understanding of the failure mechanism, and failure mode changes, of polymer glasses is lacking. Objective - this research is to study how the chemical and physical structure of polymeric glasses is related to mechanical response and deterioration in service environments, in particular, moisture and humidity. How work contributes - it is expected that this research will contribute to the understanding which must be established before laboratory simulation tests can be constructed which will predict in-service failures in structural composites.

Two distinct types of epoxies, namely (a) lightly crosslinked systems and (b) highly crosslinked, void-dependent systems, will be studied to determine the effects of structure, morphology and voids on the mechanical properties and their relation to failure modes by several current and advanced characterization techniques. The effect of cyclic heat and moisture on the microvoid characteristics and mechanical properties will be studied. The tensile and compressive mechanical properties will be monitored as a function of temperature and strain rate to elucidate the size of the entities involved in the flow processes and a model will be developed to correlate structure to failure modes and mechanical response.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NC, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0027, SOLID STATE MATERIALS DERIVED FROM PLANAR METAL COMPLEXES
L.V. INTERRANTE, General Electric Company, *Schenectady, New York* 12305 (DF041500; F44620-76-C-0006)

AF function - future Air Force flight operations require improved electromagnetic devices for use in flight control, reconnaissance and surveillance, signal processing and control, and environmental support. Deficiency - a need exists for new materials which can be exploited for the design of new concepts and classes of electronic and magnetic devices. Objective - to obtain the understanding and predictive capability necessary for effective utilization of the unique features of existing transition-metal complexes in solid-state applications and to permit purposeful synthesis of new materials for satisfying the requirements. How work contributes - new electromagnetic materials will be synthesized and their properties identified.

The research focuses on the synthesis of new solid-state materials, combining planar organic and transition-metal complexes, and the characterization of their structures and physical properties.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NC, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0028, BIFURCATION AND STABILITY THEORY WITH APPLICATIONS TO PROBLEMS OF COMBUSTION AND FLAME PROPAGATION 13910-MX

B.J. MATKOWSKY, Rensselaer Polytechnic Inst., School of Arts & Sciences, *Troy, New York* 12181 (DA0E9125; DAAG29 76 G0253)

To conduct a research program in bifurcation and stability theory with applications to problems of combustion and flame propagation. Specific topics include study of the transition from laminar to turbulent flame propagation and formation of cellular flame fronts. Relevance - the research may have an important impact on a comprehensive gas-phase/solid-phase ignition and unsteady solid propellant combustion model currently under development at BRL. The work is also relevant to the combustion task of the energetic materials research project at PA.

Asymptotic and singular perturbation methods will be employed to investigate stability.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

3.0029, RESEARCH STUDY OF COMPOSITES AS SUBSTRATE MATERIALS IN LARGE SPACE TELESCOPES

A.V. SHARMA, North Carolina A & T St. Univ., Graduate School, *Greensboro, North Carolina* 27411 (NSG 8045)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0030, DEVELOPMENT OF COMPOSITE MATERIAL UPPER DRAG BRACE FOR F-15 AIRCRAFT

M.J. BIEBER, Cleveland Pneumatic Company, *Cleveland, Ohio* (DF135650; F33615-75-C-3152)

Fatigue and corrosion are a major cause of landing gear hardware failure resulting in high landing gear life-cycle costs. The objective of this work unit is to develop a graphite epoxy drag brace suitable to replace the titanium upper drag brace on the F-15 main landing gear. This graphite epoxy hardware will be approximately 30 percent cheaper, weigh 40 percent less than the production hardware and be virtually free from the fatigue and corrosion problems experienced by conventional landing gear hardware.

The work to be done will be based on the successful AFFDL development of a small drag brace for an A37B aircraft and other composite landing gear hardware developed by the AFFDL. The F-15 composite drag brace will be designed, fabricated and tested to the current static and fatigue load requirements of the corresponding production hardware. Initial acquisition costs for a production quantity of 200 will be determined and cost savings established over the current titanium component.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0031, ENVIRONMENTAL EFFECTS, DAMPING AND COUPLING PROPERTIES OF COMPOSITE LAMINATES

S. KULKARNI, Material Sciences Corporation, *Blue Bell, Pennsylvania* 19422 (DF043310; F44620-76-C-0080)

AF function - Air Force advanced aerospace vehicles continue to require lower cost structures of enhanced performance and durability. Advance composites as a structural material are a prime candidate to satisfy this requirement. Deficiency - inadequate understanding of dynamic response and environmental effects related to advanced composites is an inhibitor to the application of composites. Objective - the objective of this research is to develop theoretical models of the dynamic properties and environmental degradation of advanced composites and to apply these models to problems involving panel flutter. How work contributes - this research contributes to 6.2 and ADP programs which are developing the technology necessary to apply advanced composites as primary structures to flight vehicles.

The approach will be to develop and solve the governing differential equations utilizing realistic material response which includes the effects of shear deformation, rotary and coupling inertia, and material damping (dynamic viscoelastic behavior of composite laminates). The important influences of the changes in material response resulting from environmental effects will be incorporated into the evaluation. These stiffness and damping changes induced by moisture and temperature effects can be expected to influence the desired laminate configuration for flutter resistance. The linear piston theory will be used to model the aerodynamic effects.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0032, INTERFACE CHARACTERIZATION OF METAL MATRIX COMPOSITES

A. LAWLEY, Drexel University, School of Engineering, *Philadelphia, Pennsylvania* 19104 (NSG 3128)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0033, SHOCK TUBE KINETICS AND MODELLING OF PROPELLANT COMBUSTION

R. FIFER, U.S. Army, Pitman Dunn Laboratory, *Philadelphia, Pennsylvania* 19137 (DA0B0589)

To study the high-temperature kinetics of simple reactions which take place during propellant combustion. To combine determined rate constants with other known constants in a numerical integration which attempts to predict observed features of propellant combustion.

The shock tube technique is the principal method to be used to obtain quantitative high-temperature reaction data for gas-phase reactions. Mixtures of reactants will be shock heated to precisely known temperatures in the 1500-3000 degrees K range and the reaction rate measured by monitoring the time-dependent reactant and/or product concentration profiles using fast kinetic spectroscopy techniques in absorption or emission. Each reaction will be studied over a range of temperatures in order to obtain an activation energy for the reaction. This will allow a rate constant at any temperature to be defined. A necessary part of the kinetic modelling work will be the initiation of a systematic and continuing program of compilation, analysis and updating of available and relevant high-temperature data. Furthermore, procedures will be developed for screening large numbers of possible elementary reactions for those most important for use in the kinetic modelling calculations.

ADDENDA: Supporting Agency Address is: ARMCOM Pitman-Dunn Laboratory, Frankford Arsenal. Philadelphia, Pa. 19137

SUPPORTED BY U.S. Dept. of Defense - Army

3.0034, REACTIVE ATOMIC SPECIES GENERATED AT HIGH TEMPERATURES AND THEIR LOW-TEMPERATURE REACTIONS TO FORM NOVEL SUBSTANCES

P.S. SKELL, Penn. State University, School of Liberal Arts, *University Park, Pennsylvania* 16802 (DF040000; AF-AFOSR-2748-75)

New approaches to making high-purity electromagnetic materials as well as methods for making improved environmentally resistant coating materials are needed for Air Force aerospace applications. This research involves a study of chemical and physical properties of vaporized metal atoms and their reactions with organic molecules. Metals vaporized include silicon, nickel, boron, magnesium, platinum, aluminum, cobalt and tungsten. The techniques employed in generating these high- tem-

perature substances involve electron bombardment, thermal vaporization, and electric arc vaporization methods. These substances are trapped in a low-temperature matrix where they are available for studies of their properties and their reactivity with organic molecules to form organometallic compounds.

ADDENDA: Supporting Agency Address Information: AF Office of Scientific Research NC, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0035, A DESIGN STUDY OF HIGH-TEMPERATURE, ADVANCED COMPOSITE STRUCTURES
C.L. BLACKBURN, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916 (NSG 1340)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0036, THE INFLUENCE OF HOLD TIMES ON FATIGUE CRACK GROWTH OF ALUMINUM ALLOYS
H.L. MARCUS, Univ. of Texas, School of Engineering, *Austin, Texas* 78712 (DF042770; AF-AFOSR-2955-76)

AF function - the longevity, reliability and life-cycle cost of aerospace structures are related to the fatigue properties of the structural materials used. In fact, the fatigue properties of structural materials often limit their application, as well as the performance of the system in which they are incorporated. Thus, it is important to understand the mechanism of fatigue. Opportunity - one of the areas in fatigue crack propagation that has not been investigated in any depth is the influence long hold times under stress have on subsequent fatigue crack growth. This information on the relaxation behavior at the crack tip is vital since the general testing techniques in evaluating materials and structures use accelerated time schedules and are not representative of normal operation of a system. Objective - this research will establish how crack-tip relaxation effects, resulting from long hold times, will influence subsequent fatigue crack propagation in aluminum alloys. How work contributes - provides the basis for improved airframe structures.

The relaxation studies will be performed on 2000 and 7000 series aluminum alloy samples to which simulated cyclic stress-strain damage has been done, and the data correlated with direct measurements at the crack tip of compact tension and center-crack specimens. The influence of a variety of loading conditions and changes in microstructures will be studied to establish the important metallurgical variables involved.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NE, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0037, BASIC RESEARCH ON FUEL MIST FLAMMABILITY AND INHIBITION THEREOF 14208-CX
W.D. WEATHERFORD, Southwest Research Institute, *San Antonio, Texas* 78228 (DA0E9140; DAAG29 76 C 0013)

To study the mechanisms of mist flammability phenomena to resolve ambiguous information on ignition requirements, flame speeds, and flammability limits of multicomponent fuels dispersed in such heterogeneous systems. Relevance - the army has a need for methods for reducing fire vulnerability of aircraft turbine fuel. The proposed studies should provide definitive results which would lead to improved in-flight fuel fire resistance and post-crash fire resistance.

Appropriate experimental devices and techniques will be developed for quantitative determination of the aforementioned flammability characteristics in initially non-turbulent systems. Burner studies of mist flammability phenomena and antimist agent influences will be initiated.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

3.0038, POSITRON ANNIHILATION STUDIES OF DEFECTS IN SOLIDS
J.G. BYRNE, Univ. of Utah, School of Engineering, *Salt Lake City, Utah* 84112 (DF040820; AF-AFOSR-2810-75)

Nondestructive evaluation (NDE) of materials before and during service saves the Air Force many lives and millions of dollars annually. Structural (airframe) and high-performance (turbine engine) materials must be inspected periodically and evaluated to determine their continued use or need for replacement. Many critical defects such as metal fatigue and small cracks are impossible to evaluate with current NDE techniques. This research seeks to develop a new technique, positron annihilation, to inspect small internal defects in metals. Doppler broadening of the annihilation radiation will be studied instead of the angular correlation or lifetime measurements which require coincidence circuitry and larger, less portable, experimental equipment. Doppler broadening requires only a single detector and may be performed at much higher counting rates than the other techniques. Initial studies will examine the role of edge dislocations in trapping positrons. Separation of traps from other imperfections such as grain boundaries, micro- cracks, impurities, screw dislocations, etc., must be made.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NE, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0039, HT ST 75-9 - COMPOSITE COMPONENT TESTING TECHNOLOGY FOR ARMY AIRCRAFT MATERIALS
P.J. HASELBAUER, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604 (DA0D3982)

To develop improved reliable means of monitoring and evaluating by nondestructive testing techniques, the structural integrity of new materials (particularly composites) as used in the manufacture of new aircraft components and hardware.

The latest advancements in non-destructive test equipment and applications will be reviewed as to optimum methods for measuring the quality characteristics including properties, imperfections, uniformities, nonuniformities, geometrical dimensions, etc., of materials and components. Testing procedures will be developed to effectively employ these findings in the test and evaluation of new metal and composite structures. Test equipment and instrumentation will be procured, existing equipment will be updated, and specialized NDT, methods such as microwave, optical and acoustic holography, and acoustic emission will be examined as candidate support equipment.

ADDENDA: Supporting Agency Address is: AVSCOM Eustis Directorate, U.S. Army Air Mobility Research and Development Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

3.0040, SURFACE CHEMISTRY OF SMALL METAL PARTICLES
UNKNOWN, Washington State University, Graduate School, *Pullman, Washington* 99163 (NCA 2-840701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, RAREFIED FLOW FIELD ANALYSIS
G.A. BIRD, Univ. of Sydney, *Sydney, New South Wales, Australia* 2006 (NSG 7272)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0002, OPTICAL WAVEGUIDE LENSES
D.B. ANDERSON, Rockwell International Corp., *Anaheim, California* 92803 (DF103850; F33615-76-C-1040)

Optical waveguide lenses are required for incorporation into a wide-band, high-resolution, real-time microwave spectrum analyzer being developed in house under work unit 20010222. Air Force requirements for radar spectrum analysis are discussed in SAC ROC 15-69, EST EN 1709-69- 19, SAMSO TN 1709-68-05 and ASD TN 16-72-12. The objective is to continue the optimization of near diffraction limited optical waveguide elements, including lenses and reflectors, that have a minimum of aberrations and scattering. Two functions are to be demonstrated - collimation within a waveguide of light coupled from a GaAs laser diode, and demonstration of a telephoto lens with a 10-1 telephoto ratio. Approaches to designing these components should be applicable to diffused and/or sputtered waveguiding layers on LiNbO3 substrates. The program will culminate with the contractor's fabrication of a series of optical elements on an AF-supplied waveguiding structure which will, after further processing, be used in a feasibility demonstration at the AFAL of an integrated optics RF spectrum analyzer.

In the present program a variety of techniques for making optical waveguide reflectors and lenses are being evaluated. Reflection is being attempted by providing a vertical termination of a waveguide which is then back filled with a metallic layer. This structure should be analogous to a conventional metallic mirror. Lens structures to be examined include geodesics and refractors. In a geodesic lens, the light rays follow arcs on a curved surface to a focus. In the refractive structures, use is made of the dependency of the effective refractive index of a waveguide mode on both the bulk refractive index and the thickness of the waveguide layer. In the continuation of the program the most promising of the above techniques will be applied to the task of making beam collimators and telephoto lenses in diffused and/or sputtered waveguide layers on LiNbO3 substrates.

ADDENDA: Supporting Agency Address is: AF Avionics Laboratory DHO, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0003, RADIATION-HARDENED MOS/SOS COMPARATOR

D.T. BUTCHER, Rockwell International Corp., *Anaheim, California* 92803 (DF900770; F19628-75-C-0185)

AF function - radiation hardness of Air Force space and missile systems. Deficiency or opportunity - current nuclear hardness requirements for semiconductor devices and integrated circuits are not being met. How research contributes - this program will develop the techniques required to apply radiation-hardened MOS technology to linear/analog circuit applications.

An investigation of the techniques required to reduce the offset in threshold voltage of matched pairs of MOS transistors and to improve the tracking of the threshold voltages after radiation exposure will be performed. Device designs and processes will be developed to reduce the rapid increase in output conductance of N-channel MOS/SOS transistors with increasing drain voltage ('kink' phenomena). As a demonstration vehicle for the degree of success obtained in device improvement, a radiation-hardened MOS/SOS voltage comparator will be designed and fabricated utilizing the improved devices developed.

ADDENDA: Supporting Agency Address is: Rome Air Development Center ETS, Griffiss AFB, N.Y. 13440

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0004, DIGITAL AUTOPILOT DESIGN STUDY

D.D. SWORDER, Univ. of Southern California, School of Engineering, *Los Angeles, California* 90007 (DF043510; AF-AFOSR-2995-76)

Air Force function - the flexibility of digital controllers for such uses as Air Force aircraft, reentry vehicles, and missile autopilots is making their use essential for modern systems. Deficiency - size and power constraints dictate a very limited word length and restricted memory size, and existing implementation methods are at their limit with regard to the minimization of computation. Objective - the objective of this proposal is to explore means for developing improved digital design techniques by application of generalized transforms. How work contributes - success in this work will reduce the implementation requirements of digital autopilots.

Particular emphasis will be given to the use of the fast Hadamard transform for control system compensation. This will require the development of a method for relating amplitude and phase characteristics of the Hadamard filter to those of the conventional compensation. A compensator will be designed and coded using both conventional techniques and the fast Hadamard transform, and then comparisons will be made between them in terms of running time, memory requirements, and effects of quantization. A microcomputer will be used for this comparison test.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NM, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0005, OPTIMIZED THIN-FILM LIGHT SOURCES

R. HUNSPERGER, Hughes Aircraft Company, *Malibu, California* 90265 (DF099780; F33615-75-C-1024)

The objective of this program is to develop a technique for efficiently coupling a semiconductor injection laser to an integrated optical circuit (IOC) in a hybrid configuration. It is desired to couple at least one watt of pulsed power into an optical waveguide with a coupling efficiency better than 10 percent. The laser must operate at 300 degrees K at 10,000 pps with 50-250 nanosec pulses. The wavelength should be in the range 0,8 to 1.0 micron. A further objective is to use the coupling technique to provide radiation for the evaluation of coupling joints between multimode optical fibers which are thermally fused by a CO2 laser.

A GaAs diode laser will be butt-coupled to a planar niobium oxide waveguide on a glass substrate. By the term butt-coupling it is meant that the emitting face of the diode laser and the end of the planar waveguide will be brought into near optical contact with their respective waveguiding region aligned. It is expected that over 20 percent of the light emitted by the diode will be coupled into the lowest order mode of the planar waveguide.

ADDENDA: Supporting Agency Address is: AF Avionics Laboratory DHO, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0006, DESIGN, CONSTRUCTION AND FLIGHT OF A NEGATIVE-ION MASS SPECTROMETER PACKAGE 12239

D.G. MURCRAY, Univ. of Denver, School of Arts & Sciences, *Denver, Colorado* 80210 (DA0D9295; DAAG29 76 G0211)

To observe for the first time the negative-ion component of the earth's atmosphere at 40 kilometers altitude. Relevance - The work contributes directly to the BRL BMD atmospheric environment and nuclear assessment and mitigation program. The proposed measurements will also be used by other DOD agencies, including the Army Atmospheric Sciences Laboratory and the Advanced Ballistic Missiles Defense Agency.

Mass spectrometer studies of the upper atmosphere will be conducted in two phases. Phase one involves the design, construction, and testing of an RF quadrupole spectrometer package consisting of the quadrupole, its RF electronics package, pressure and temperature sensor, cosmic-ray ionization chamber, ultraviolet sensor, blunt-probe atmospheric conductivity unit, and tape recording and telemetering equipment. Phase two involves the balloon flight of this apparatus in the autumn of 1974 or spring of 1975. The flight will be conducted in cooperation with the National Center for Atmospheric Research balloon facility at Palestine, Texas. Based on the observations, models of negative-ion content at 40 km will be developed. This study will complement positive-ion research already in progress.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

4.0007, ANALYTICAL AND EXPERIMENTAL STUDY OF SUBSONIC STALLED FLUTTER

R.A. ARNOLDI, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DF040980; F44620-75-C-0066)

AF function - advanced turbomachinery. Opportunity - improve ability to predict stall flutter. Objective - investigate and quantify the effects of high aerodynamic loading on oscillating

airfoils in cascade. How work contributes - will improve the analytical capability to predict stall flutter in advanced turbomachinery.

An analytical and experimental study of dynamic stall as related to stall flutter in cascades will be done. The experimental data will be compared to existing theory which will be modified as required to improve prediction capability.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0008, AERODYNAMIC WINDOW PERFORMANCE AND OPTICAL QUALITY

R.N. GUILE, United Technologies Corp., *Hartford, Connecticut* 06108 (DF036140; F44620-73-C-0031)

AF function - weaponry. Deficiency - aerodynamic windows for airborne gas lasers show high sensitivity of window gas leakage rates to pressure adjustments for varying flight altitudes. Better understanding and control of the window and wall boundary layers could make possible design and operation techniques to control the leakage rates to within acceptable limits. Objective - to measure the characteristics of the end-wall boundary layers in a model aerodynamic window and to discover the role these boundary layers play in the observed aerodynamic window leakage; also, to investigate means of controlling the end-wall boundary layers in order to reduce the leakage flow to satisfactory levels. How work contributes - aerowindow requirements include leakage rates between an acceptable minimum and maximum, correct pressures at inner and outer boundaries to match the cavity and atmospheric pressure, and low phase distortion of the laser beam. Control of the end-wall boundary layers may be the only way to achieve the first of these requirements, since the other two requirements use up all the other adjustable parameters of the window operation.

An existing aerowindow model will be connected to a simulated laser cavity and to a wind-tunnel air supply. The end-wall boundary layer will be probed for Pitot and static pressure distribution, and leakage rates into the cavity will be measured. Flow visualization methods will also be used. Possible methods of altering leakage rates will be investigated.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0009, LASER PHYSICS - LIFETIME MEASUREMENTS, UV-LASER MEDIA, AND EXCITED-STATE SPECTROSCOPY

W.R. BENNETT, Yale University, Graduate School, *New Haven, Connecticut* 06520 (DF018850; F44620-76-C-0078)

AF function - future operation of aerospace systems require improved devices for navigation, guidance, reconnaissance, and communications. Opportunity - laser technology is expected to provide assistance in meeting some of these objectives by providing more powerful and versatile sources, and more sophisticated methods of using optical devices. An understanding of physical mechanisms in gas laser media will lead to a description of the specific operating parameters for these laser sources and related components and their uses. Objective - this research emphasizes the precise measurement of excited- state lifetimes in the nanosecond range, the development of mode locking techniques for the measurement of ultra-short lifetimes, and techniques in which gas mixtures will be used directly in a transverse electric discharge laser with the object of producing quasi-cw oscillation under conditions which normally result in laser pulse durations of a few nanoseconds. How work contributes - this research will contribute to an understanding of relaxation mechanisms and the general properties of gas laser media, leading to a description of the specific operating parameters for improved laser sources and related components and their uses. The results are expected to provide criteria for the design of new systems employing improved efficiencies and higher power with operation from the infrared to the ultraviolet. The proposed research is at the frontier of the field and is expected to provide new ideas in an area not yet well understood.

A series of precise lifetime measurements has been completed for the upper states of the more important noble gas ion laser transitions. The present lifetime measurement program will be extended in the direction of UV and visible molecular laser transitions. Techniques have been developed for the precision measurement of lifetimes in the subnanosecond domain and a study of ionic lifetimes radiating in the vacuum ultraviolet is currently under way. A new laser spectroscopy experiment based on acoustic detection will be carried out for the analysis of molecular energy states.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NP, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0010, INSTRUMENTATION FOR A REMOTE-SENSING CO SUB 2 LASER LOPAIR SYSTEM

R. MCINTOSH, Perkin Elmer Corporation, *Norwalk, Connecticut* 06852 (DA0E0988; DAAA15-75-C-0139)

The objective of this contract is to design and fabricate a fieldable remote-sensing study instrument utilizing the CO sub 2 laser as an infrared source for the detection of chemical agents.

Past work on this project and the state-of-the-art will be reviewed. Direct versus heterodyne detection techniques will be considered. A design for a fieldable study instrument will be submitted and, if approved, the instrument will be fabricated, tested and delivered to the government. The design goals are defined in the scope of work.

ADDENDA: Supporting Agency Address is: ARMCOM Edgewood Arsenal, Aberdeen PG, Md. 21010

SUPPORTED BY U.S. Dept. of Defense - Army

4.0011, VIDEOCONFERENCING FOR CONGRESS - AN EXPERIMENTAL APPLICATION OF THE COMMUNICATIONS TECHNOLOGY SATELLITE

F.B. WOOD, George Washington University, Graduate School, *Washington, District of Columbia* 20006 (NSG 3130)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0012, STABILITY AND CONTROL PREDICTION FOR MANEUVERABLE MISSILES

J. FIDLER, Martin Marietta Corporation, *Orlando, Florida* 32805 (DF133870; F33615-75-C-3052)

Problems with stability and control technology base for multi- purpose missiles and maneuverable missiles require ongoing research and technology. The objective of this effort is to develop a better stability and control technology base for preliminary design of missiles, by using semi-empirical (DATCOM-type) methods. From the stability and control prediction methods will be developed for body- alone and cruciform missiles at angles of attack up to 180 degrees in subsonic through supersonic flight.

The approach will consist of (1) review of available prediction methods and wind-tunnel/flight-test data and (2) formulation of semi- empirical (DATCOM-type) methods.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0013, INVESTIGATION OF THE EFFECTS OF LONG-DURATION EXPOSURE ON ACTIVE OPTICAL SYSTEM COMPONENTS

M.D. BLUE, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (NAS 1-14654)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0014, PREDICTION OF SEPARATING TURBULENT BOUNDARY LAYERS INCLUDING REGIONS OF REVERSED FLOW, 13376-E

R.R. PLETCHER, Iowa State Univ. of Sc. & Tech, School of Engineering, *Ames, Iowa* 50011 (DA0E9042; DAAG29 76 G0155)

To develop and evaluate improved methods of predicting incompressible turbulent boundary-layer flow in the neighborhood of separation including the region of recirculation downstream of the separation point. This research is directly relevant to studies at the Ames Directorate of AMRDL concerning helicopter rotor aerodynamics and to studies at the MICOM concerning missile control and chemical laser flows.

The iterative calculation procedure recently developed for computing past the separation point in laminar flow will be adapted to turbulent flow, initially using a simple mixing-length model of turbulence.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

4.0015, FINITE ELEMENTS FOR FLUID DYNAMICS
N. GEFFEN, Tel Aviv University, *Tel Aviv*, *Israel* (DF037160; AF-AFOSR-2561-73)

AF function - aerospace vehicles. Opportunity - both present and future Air Force aerospace vehicles will be required to fly at high speeds and have an ability to maneuver at all speeds. This will require that new and improved engineering design and analysis methods be developed throughout the total speed regime for the precise engineering determination of the performance and system capabilities of these vehicles. Objective - this research will attempt to develop new methods for fluid dynamical analysis using high-speed computers, methods which circumvent the disadvantages of currently employed machine algorithms. How work contributes - the ability to perform aerodynamic calculations about complex (real) shapes using finite-element methods which are becoming standard in structural analysis could lead to great improvements in efficient use of computers as engineering design and analysis tools. Resolutions of the variational problems underlying the use of such finite elements will do much to bolster engineering confidence in the (numerical) finite-element methods, thereby giving the engineer an added and vital tool for use in predicting the 'grand ensemble' vehicle flow field.

This research will investigate the possibility and feasibility of using finite-element analysis and procedures for the solution of quasi- linear hyperbolic and mixed initial value problems, with application to unsteady flow about bodies, time-dependent simulation of aerodynamic phenomena in all speed ranges, steady transonic flows (including the case of the super-critical wing) and to internal gasdynamic flows (e.g., cascades and inlets).

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0016, RESEARCH ON CENTIMETER LASER RANGING ACCURACY TO EARTH SATELLITES
C.O. ALLEY, Univ. of Maryland, School of Engineering, *College Park*, *Maryland* 20740 (NSG 5129)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0017, STOCHASTIC AND ADAPTIVE SYSTEMS
M. ATHANS, Mass. Inst. of Technology, School of Engineering, *Cambridge*, *Massachusetts* 02139 (DF034200; AF-AFOSR-2273-72)

Air Force function - one function vital to such diverse Air Force systems as space systems, radar, boost vehicles, aircraft, and guided missiles is control. Deficiency - a significant problem commonly encountered in controlling each of these systems is that of uncertainty. Objective - the objective of this proposal is to improve understanding of the interrelations present in alternate ways of handling uncertainties. How work contributes - success in the pursuit of this objective would enable engineers to design more accurate and more reliable controllers for important Air Force systems.

The problem of controlling systems in the presence of uncertainties will be addressed through five avenues. The first deals with modelling and identification, with goals of solving the stochastic representation problem, investigating identifiability concepts, and developing design algorithms for identification. The second approach consists of an investigation of several aspects of nonlinear filtering. The third concerns the analysis of stochastic systems, adapting methods used in the bilinear case to the study of moment evolution in a more general nonlinear situation. The fourth approach, multiple mode adaptive control, would be subjected to some basic analytical research to clarify its strengths and weaknesses. Finally, a proposed geometric theory of linear multivariable control would be extended for application to stochastic systems.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NM, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0018, PASSIVE RING RESONATOR LASER GYROSCOPE
H. ZIMMERMAN, Mass. Inst. of Technology, School of Engineering, *Cambridge*, *Massachusetts* 02139 (DF044120; AF-AFOSR-3042-76)

AF function - navigation, guidance and control of aircraft, spacecraft and missiles require sensors of angular rotation rate in inertial space. Deficiency - the coming use of ringlasers in platform and strapdown systems poses problems of cost, size and reliability. Objective - the intrinsic limitations of the ringlaser are to be avoided by new approaches to angular rate sensing using optical means. How work contributes - the new device should be free from lock-in and bias-drift effects usually encountered in conventional laser gyros and should allow size reduction without sacrifice of sensitivity.

Investigation of the limitations of a new laser gyroscope which uses a passive ring resonator as the rotation sensing element and two independently controlled laser frequencies to read out the lengths of the clockwise and counterclockwise paths of the resonator. A sensitivity of one milli-earth-rate is anticipated in an integration time on the order of 100 seconds. Because the laser is outside the ring interferometer solid-state GaAs lasers may be used which would make the gyroscope small in size.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NE, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0019, READ DOUBLE DRIFT AND OTHER IMPROVED AVALANCHE STRUCTURES
R. BIERIG, Raytheon Company, *Waltham*, *Massachusetts* 02154 (DF096830; F33615-74-C-1049)

To develop improved Impatt diode structures which would yield ten watts cw at x-band and five watts cw at ku-band with 40 percent efficiency. These diodes will then be used in the development of 30 watt cw x-band and 15 watts cw ku-band linear amplifiers.

To develop both read diodes and double drift structures in gallium arsenide. The development of epitaxial techniques for growing the optimum structures will be included.

ADDENDA: Supporting Agency Address is: AF Avionics Laboratory DHM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0020, THEORETICAL STUDY OF LEADING EDGE BUBBLES AND LEADING EDGE STALL OF AIRFOILS 12221-E
P. CRIMI, Avco Corporation, *Wilmington*, *Massachusetts* 01887 (DA0E8948; DAHC04-74-C-0035)

To conduct a theoretical study of leading-edge separation bubbles and leading-edge stall of airfoils. The proposed research is directly relevant to the AMRDL-Ames Directorate research on dynamic stall. A solution to the bubble-bursting problem is needed for incorporation into the Ames Directorate research program for predication of both static and dynamic stall.

The method of approach will be to use numerical integration of the boundary-layer equations for the attached flow and a moment-integral method for both the laminar separated and turbulent reattaching glows and including inviscid-viscous interaction iteration.

Supporting Agency Address Information: AMC Army Research Office, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

4.0021, LASER INTERACTION AND X-RAY EMISSION FROM METALLIC PLASMAS

R.S. ONG, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (DF041670; AF-AFOSR-2904-76)

AF function - operation of high-altitude vehicles in a post-nuclear explosion environment, development of electromagnetic weapons, space and ionospheric communications as well as countermeasures demand advanced equipment unavailable to date. Deficiency - present-day information is inadequate to design the aforementioned equipment. Such information may be obtained from experimental and theoretical work in metallic (collisional) plasmas. Objective - this project will investigate theoretically the behavior of high-density, high-Z and moderately high- temperature plasmas which are strongly dominated by collisional and partial ionization phenomena. Such plasmas are metallic plasmas produced by exploding wires. This theoretical work will be coordinated with the experimental work on exploding wires performed by Prof. Bach. Contribution - this work is a part of a comprehensive program on plasma research for the development of an X-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and ion beam), the development of space and ionospheric communications and the development of countermeasures.

This project will perform theoretical calculations, analyze, evaluate and correlate the available experimental results. Specifically (a) it will investigate MHD plasma simulation by using the recently improved codes with added ionization and emission descriptions. It will study how an intense laser beam can influence the X-ray emission of dense plasmas, (b) it will study the collision phenomena in dense plasmas by examining the possibility of using more sophisticated methods recently developed in kinetic theory, (c) it will investigate the interaction of intense laser beams with magnetized plasmas, by studying the space and time evolution of wave packets. A typical example is the absolute and convective nature of the stimulated Brillouin scattering in a magnetized plasma. Another example is the stimulated Compton scattering in which electromagnetic waves are backscattered by bunches of particles rather than by coherent plasma waves.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NP, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0022, ELECTROMAGNETIC SOUND GENERATION FOR NON-DESTRUCTIVE TESTING

R.L. THOMAS, Wayne State University, School of Liberal Arts, *Detroit, Michigan* 48202 (DF038370; AF-AFOSR-2648-74)

AF function - aircraft structures of aluminum, titanium and steel are subject to degradation by poor fabrication, fatigue, corrosion and simple ten-ile stresses. Loss of the aircraft, its mission and crew may occur if a catastrophic failure results from this degradation. Opportunity - nondestructive evaluation (NDE) techniques are being developed to find these degraded or flawed areas before failure occurs. The safety and useful lifetime of such components is greatly enhanced. Objective - this research seeks to understand the generation, transmission, and scattering of bulk and surface ultrasonic vibrations in metals for NDE applications. How work contributes - contributes to quality assurance, and field maintenance inspection of critical airframe and engine components.

Electromagnetically generated waves are launched without physical contact with the metal. Bulk and surface waves are used to study scattering and velocity parameters indicative of structural damage.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NE, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0023, PLANNING FOR A CENTER FOR INFORMATION, EDUCATION AND TECHNOLOGY DEVELOPMENT IN REMOTE SENSING

D.E. WALSH, Univ. of Mississippi, Graduate School, *University, Mississippi* 38677 (NAS 8-32218)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0024, ANALYSIS OF INHERENT ERRORS IN ASYNCHRONOUS DIGITAL FLIGHT CONTROLS

C.R. SLIVINSKY, Univ. of Missouri, School of Engineering, *Columbia, Missouri* 65201 (DF043050; AF-AFOSR-2968-76)

Air Force function - complex nonlinear controllers are an important contributor to the improved performance promised for air force systems presently in the design process. Deficiency - the digital controllers required to provide this computational flexibility for control are generally employed with redundancy, since their failure in important functions such as flight control could result in catastrophic loss. The effects of asynchronous operation of parallel digital channels are poorly understood, making channel failure detection difficult, if not undetectable. Objective - the objective of this research is to develop better methods for analyzing the effect of asynchronous redundant digital control channels. How work contributes - this work will facilitate the application of modern digital technology to advanced Air Force systems.

This work will expand upon the results obtained by the principal investigator while working at the AF Flight Dynamics Laboratory under the USAF/American Society for Engineering Education Summer Faculty Research Program during the past summer. Specifically, the approach will be to increase the complexity and generality of the models and covariance analysis, augment the software to accommodate the more sophisticated models, to perform parametric studies of applicable systems of current interest to the Air Force, and to correlate the results with the AFFDL Digital Avionics Information System (DAIS) hardware simulations.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NM, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0025, LSI ELECTRONICALLY PROGRAMMABLE LOGIC ARRAYS

D. HAMPEL, Radio Corporation of America, *Camden, New Jersey* 08102 (DF092640; F33615-73-C-1089)

This effort is concerned with the theory, design and realization of distributed logic/memory large-scale integrated (LSI) arrays required by advanced avionics distributed processors. These arrays will be capable of adapting to the various functional requirements without any change in the basic design or configuration of the array. This will be accomplished through array synthesis and design utilizing a mix of compatible memory and logic techniques.

The approach shall consist of device compatibility studies, array synthesis, design studies and subsequent fabrication and evaluation of the programmable arrays. This will be supported by tradeoff studies which include practical as well as economical considerations.

ADDENDA: Supporting Agency Address is: AF Avionics Laboratory DHE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0026, DEVELOPMENT OF LOW-COST CRT HEAD-UP DISPLAY SYSTEM

R. ROVER, Bendix Corporation, *Hackensack, New Jersey* 07608 (DF135980; F33615-76-C-0017)

The requirement exists in the Air Force for a low-cost, easily installable head-up display system for current and future aircraft to provide flight control parameters while flying VFR. It is the objective of this effort to investigate a low-profile CRT glare shield mounted HUD design to meet this requirement.

A contractor designed CRT HUD will be built and installed in an AFFDL aircraft simulator for evaluation. If the evaluation is successful, a self-contained symbol generator will be built and the

system will be installed in a T-39 for a flight test evaluation by the Instrument Flight Center, Randolph AFB, Texas.

ADDENDA: Supporting Agency Address is: AF Flight Dynamics Laboratory FGR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0027, A THREE-DIMENSIONAL STUDY OF FIN-INDUCED SHOCK WAVE TURBULENT BOUNDARY LAYER INTERACTIONS 14026-E

I.E. VAS, Princeton University, School of Engin. & Appl. Sci., *Princeton, New Jersey* 08540 (DA0E9174; DAAG29 76 G0269)

To more thoroughly investigate the scale of the interaction between a shock wave from a sharp leading edge generator and a turbulent boundary layer on a flat plate by changing the boundary layer thickness using unswept and swept leading edge flat plates. The research is relevant to activities at BRL and other Army laboratories concerned with designing fin-stabilized anti-tank projectiles and fin-stabilized long- range missiles.

An experimental study will be conducted in the Mach 3 high-Reynolds-number supersonic facility of the contractor by examining large-scale effects of the boundary layer in the interaction region and measuring heat transfer for a thin boundary layer configuration.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

4.0028, LASER TRANSDUCERS

E. SCHIEL, U.S. Army, Combat Surv. & Target Acq. Lab, *Red Bank, New Jersey* 07703 (DA0D1972)

The objective of this effort is to develop injection laser transmitters suitable for high-data-rate operation for communications, to explore solid-state devices for input and output of low-loss fiber optics including coupling techniques, to characterize electrooptic materials for high-speed optical modulators applicable to lasers used in optical high-data-rate information transfer systems.

The operational characteristics of large optical cavity injection lasers for use in high-bit-rate/large-duty-cycle applications will be explored and transmitters including optical couplers to low-loss fiber optics developed. Prototype fiber optic links for high-data-rate operation of input/output devices will be designed and tested. New electrooptic materials will be characterized, mainly for high-speed operation in light modulators.

ADDENDA: Supporting Agency Address is: ECOM CS and TA Lab, DRSEL- CT-L, AMSEL-CT-L, Ft. Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

4.0029, METHODS FOR COMPUTING THE PATTERN OF COMPRESSIBLE FLUID FLOW IN NOZZLES OR PAST BODIES

C. MORAWETZ, New York University, School of Science & Engin., *New York, New York* 10003 (DF039000; F44620-74-C-0062)

AF function - the design of effective aerospace vehicles requires knowledge of the complete flow field past such objects. Deficiency - computational techniques for transonic flows, flows with shocks, and flows with mach reflections are lacking in efficiency and effectiveness. Objective - this research will investigate numerical methods for computing location of shocks and sliplines and methods for computing transonic flows. How work contributes - numerical methods could lead to the development of efficient codes for effectively computing the complete flow field past objects for utilization in the design of aerospace vehicles.

The artificial compression method will be utilized for computing the flow field past a bell-shaped body. A method for keeping track of fluids separated by a slipline will be investigated. A numerical scheme for solving the mixed equations arising in transonic flows will be studied also.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NM, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0030, RESEARCH ON MICROWAVE JUNCTION-GATE FIELD EFFECT TRANSISTORS 13586-EL

S.K. GHANDHI, Rensselaer Polytechnic Inst., School of Engineering, *Troy, New York* 12181 (DA0E9120; DAAG29 76 G0172)

To investigate and improve junction field effect transistors in III-V compounds. Relevance - electronic III-V compound devices permit operation into tens of gigahertz. Junction gate field effect transistors are expected to be more reliable than presently used Schottky gate field effect transistors. Vital relevance to communication/navigation satellites, tactical communication links, missile guidance, EW equipment.

To study basic problems associated with the growth and characterization of the channel layer, and with obtaining an improved understanding of diffusion and masking problems associated with the junction gate.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

4.0031, DEVELOPMENT OF A METHOD FOR COMPUTING SUBSONIC AND TRANSONIC SEPARATED FLOWS 12437-E

P.M. GERHART, Univ. of Akron, School of Engineering, *Akron, Ohio* 44304 (DA0E8973; DAHC04-75-G-0026)

To develop an analytical method for computation of subsonic and transonic separated flows which is both practical and reasonably accurate for determining force changes on the body due to separation effects. This project is directly relevant to the transonic experimental and analytical work being done at MICOM, to the work on separated flows in exterior ballistics at BRL, and to the helicopter research program at AMRDL-Ames Directorate.

Based on the concept of dividing the flow field into viscous and inviscid regions, several essential elements for a successful computation procedure for separating and reattaching subsonic trubulent flows will be tried utilizing the momentum and kinetic energy integral equations for the viscous flow and small-disturbance theory for the inviscid flow.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office Research, Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

4.0032, BASIC EROSION INVESTIGATION IN SMALL TURBOMACHINERY 13653-E

W. TABAKOFF, Univ. of Cincinnati, School of Engineering, *Cincinnati, Ohio* 45221 (DA0E9138; DAAG29 76 G0229)

To investigate the erosion process of small turbomachinery in order to develop a quantitative model which will facilitate the prediction of erosion in future advanced turbomachinery in a particulate environment. Relevance - the research is relevant to the development of erosion- resistant components for helicopter gas-turbine engines and, to a lesser degree, to the design of efficient filtration devices for Army gas- turbine-driven generator sets.

Factors affecting ductile erosion, such as angle of impingement, particle velocity, size, shape, and strength, will be investigated experimentally. Experimental and analytical work will be performed to examine the effects of target material size, velocity dependence due to the angle of impingement and the aerodynamic effect of temperature on erosion of alloys for future compressors and turbines.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

4.0033, RESEARCH ON INELASTIC/PLASTIC MECHANISMS IN ROLLING CONTACT 13326-E

Y.P. CHIU, S K F Industries Incorporated, *Norristown, Pennsylvania* 19406 (DA0Z5579; DAAG29 76 C 0016)

To study the mechanical behavior of machine element contacts, static and moving, in which plastic yielding has occurred.

This research is relevant to all vehicles, equipment, helicopters and machines which involve moving parts. An understanding of failure in rolling contacts will lead to better reliability and safety as well as to reduction in wear.

Analytic methods will be used together with computer solutions to find normal and shear stresses in the solid. Plastic flow will be analyzed by an incremental technique and work hardening will be taken into account.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office P.O. Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

4.0034, OIL FILTER ANALYSIS TECHNIQUE RESEARCH PROGRAM - ARMY HELICOPTERS

R.H. HOLLINGER, Franklin Inst. of State of Pa., *Philadelphia, Pennsylvania* 19103 (DA0D4058; DAAJ02-76-C-0038)

To establish the feasibility of utilizing oil filters as a diagnostic tool through the development of one or more techniques to analyze the debris retained in engine and transmission filters. This approach to diagnostics is brought about by the current trend (GET700 engine and UTTAS transmission) toward extremely fine filtration which, based on preliminary findings, may render oil analysis (soap) ineffectual.

The contractor will determine and identify the oil filtration characteristics being used by present aircraft manufacturers and those anticipated in future aircraft. The various filter configurations and geometries to be considered will be identified. Candidate schemes of analyzing the debris accumulated in the filter element will be identified and analytically and experimentally investigated to establish feasibility.

ADDENDA: Supporting Agency Address is: AVSCOM Eustis Directorate, Air Mobility R and D Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

4.0035, GENERATION AND DETECTION OF SUBMILLIMETRE (FIR) RADIATION USING OPTICAL PUMPING IN A GAS LASER SYSTEM

M.C. SEXTON, Natl. University of Ireland, *Cork, Republic of Ireland* (DF034640; AF-AFOSR-2338-72)

AF function - there is an increasing interest in the Air Force in sources and electrooptical techniques in the far infrared and into the submillimeter region of the spectrum, particularly for reconnaissance and surveillance applications. This work will address the laser source problem in this region. Opportunity - the discovery of laser oscillations in the various cyanide gases during the 1960s transformed the source situation in the submillimeter (0.1-1.0mm) quasi-optical region of the electromagnetic spectrum. For example, in past years on this grant, the hydrogen cyanide (hcn) gas laser interferometer operating at 337 micrometers has been used as a plasma diagnostic tool to monitor electron densities in highly ionized plasma afterglows. Opportunities now exist to seek other sources in this wavelength regime for AF applications. Objective - the ultimate aim of the present work is the development of a flexible system whereby a considerable part of the submillimeter range will be covered (50-1000 micrometers) using the same laser system. This will be accomplished using the technique of optical pumping. Contribution - in the long term, this work will lead to the development of a high-power pulsed superradiant (mirrorless) system using a CO2 tea pump laser at a repetition frequency of several KHZ. he present state-of-the-art is that such sources exist but at low repetition rates. High-power, high-repetition-rates CO2 tea lasers are available and can logically be used for pumps.

A cw CO2 laser tuned pump laser and optical cavity system will be fabricated and some lasing lines from established gases, such as CH3Cl, CH3F, extracted from the cavity. Of particular interest will be methods of shifting the CO2 frequencies to obtain better resonance coincidence with the lasing transitions in the cavity and the possibilities of using a laser pump other than CO2. Also, optimization of the waveguide far- infrared cavity will be investigated.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NP, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0036, STIMULATED X-RADIATION

K. DASGUPTA, Texas Technological University, School of Arts & Sciences, *Lubbock, Texas* 79409 (DF035070; AF-AFOSR-2373-72)

Non-destructive testing of structural members of aerospace vehicles could benefit greatly from the development of an X-ray laser for use in three-dimensional holography. Attempts to develop an X-ray laser by standard population inversion techniques have been unsuccessful, primarily because of short times of excited states. This research experimentally investigates the properties of X-ray radiation which apparently is generated by a hitherto undiscovered process. A nearly nondivergent beam of electromagnetic radiation at characteristic discrete frequencies (28, 42, 68, 127, and 340 KeV) is produced when electrons in the energy range of 200 to 450 KeV strike at near grazing angle the smooth surface of conductors, semiconductors or insulators. The objective of this research program is to study the nature of this new radiation by determining the fundamental width of the discrete frequencies, the penetrating properties, role of stimulated emission, and degree of coherence and polarization to provide knowledge for interpretation of the physical phenomenon producing the radiation and for exploitation of this phenomenon for aerospace purposes.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NE, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0037, PREDICTION OF PROJECTILE MAGNUS EFFECT 13408-EX

I.D. JACOBSON, Univ. of Virginia, School of Engin. & Appl. Sci., *Charlottesville, Virginia* 22903 (DA0E9003; DAAG29 76 G0126)

To study the effect of spin rate and angle of attack on the transition of, and subsequent growth of, the boundary layer on a variety of projectile shapes in both subsonic and supersonic flow fields. The investigation is directly relevant to the magnus research being conducted at both the Ballistic Research Laboratory and Picatinny Arsenal for designing stable, long-range and accurate artillery projectiles.

Both analytical and numerical analysis techniques will be developed for the laminar boundary layer, the transition line, and the turbulent boundary layer for arbitrary spinning bodies at angle of attack. The resulting magnus effect due to asymmetry in shear stress and displacement thickness will be calculated.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

4.0038, COMPUTATIONS IN TURBULENT FLOWS AND OFF-DESIGN PERFORMANCE PREDICTIONS FOR AIRFRAME-INTEGRATED SCRAMJETS

G.L. GOGLIA, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1348)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0039, LASER ATTITUDE SENSING SYSTEM FOR SPINNING MISSILES 13640-A-E

J.E. NYDAHL, Univ. of Wyoming, School of Engineering, *Laramie, Wyoming* 82070 (DA0W5577; DAAG29 76 G0073)

To determine a missile's attitude and roll rate from laser pulses which are retroreflected to either two or three ground stations by use of either one or two roof-type reflectors on the spinning missile. A laser tracking system for automatic tracking of missiles is near demonstration at the Army Missile Command, Redstone Arsenal. A laser attitude sensing concept for rolling missiles, as proposed in this research effort, could be utilized in conjunction with the laser position sensing equipment, reducing costly and time-consuming data reduction now required with existing camera systems.

A mathematical model will be formulated for the two-station concept and utilized to determine if and when unique solutions for attitude exist. A bench-top demonstration is to be made to validate basic concepts and data-reduction algorithms.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, AURORAL AND HIGH-LATITUDE IONOSPHERIC MORPHOLOGY AND DYNAMICS
S. AKASOFU, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701 (DF261660; F19628-76-C-0074)

AF function - transpolar communications, radar and navigation. Deficiency - the polar ionosphere is presently very unpredictable to such a degree that the above functions are frequently degraded or crippled. Objective - investigate the phenomenology of the arctic ionosphere. How research contributes - provides inputs to in-house effort for modeling effects of particle precipitation on arctic ionosphere. This contractual effort is for the investigation of the phenomenology of arctic particle precipitation through the collection of data, and analysis of data so as to provide a framework for the interpretation of data collected by AFCRL Airborne Ionospheric Observatory, NKC-135 aircraft, Number 53131 and the AFCRL Goose Bay Ionospheric Observatory. The contract also provides for the interpretation of data in terms of magnetospheric phenomenology or theory.

Process and maintain aircraft and ground station all-sky camera data. Gather and interpret ionospheric and magnetospheric data for selected periods in support of special studies. Investigate ionospheric response during a magnetospheric substorm. Clarify relationship between discrete aurora and continuous aurora using DMSP data. Study auroral arc brightenings and interplanetary magnetic field changes as a predictor of substorm onset.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory PH, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0002, RADIOCARBON DATING AND ENVIRONMENTAL RESEARCH
W.F. LIBBY, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (EAR76-14273)

The project concerns application of the radiocarbon method to three separate and distinct problems: (1) a determination of the residence time of carbon dioxide in the stratosphere, (2) a determination of the rate of climatic change at the end of the Pleistocene Epoch, and (3) detection of prehistoric movements of the San Andreas Fault.

Carbon dioxide will be sampled from the lower stratosphere on a monthly basis with sampling devices designed to be used on NASA's high- altitude research vehicle (U-2). The radiocarbon content of the carbon dioxide thus collected will be determined and used to calculate mixing rates of carbon dioxide between the stratosphere and the troposphere.

The method of determining rate of climatic change will be determined by examination of the botanical content and radiocarbon dating of Neotoma middens. The plant species present in the middens will be used as a measure of the local climate and the radiocarbon age will date it. Accumulation of data from middens of varying age will thus yield the rate of climatic change.

The third part of the research will concern the dating of movement along major faults by radiocarbon dating of plant materials buried by landslide activity associated with the movement. Fault displacement and the resulting earthquake frequently generate large landslides that bury trees and other plants, thus preserving a record of the time of faulting.

The three projects described above present important applications of the radiocarbon dating technique.

SUPPORTED BY U.S. Natl. Science Foundation

5.0003, DIGITAL IMAGING RESEARCH FOR METEOROLOGICAL APPLICATIONS 13971-GS
T.H. VONDERHAAR, Colorado State University, School of Science, *Fort Collins, Colorado* 80521 (DA0E9227; DAAG29 76 G0324)

To design and develop an all-digital, computer-controlled, rapid refresh display system for processing meteorological data obtained from a geostationary satellite platform, and use this system to study atmospheric mesoscale processes which can be detected with the system. Relevance - the research is relevant to several Army research efforts at the Atmospheric Sciences Laboratory including weather effects on air and ground operations, determination of winds aloft for nuclear fallout, severe storm detection and forecasting and remote sensing of atmospheric conditions in inaccessible areas.

The research involves instrumentation design by electrical engineers and theoretical and experimental research by atmospheric scientists. The work includes use of numerical models of the physics and dynamics of weather systems to explore diagnostic aspects of complex mesoscale systems such as squall lines, thunderstorms, and others.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

5.0004, GEOID STUDIES
D.C. BROWN, Duane Brown Assoc. Sys. Inc., *Melbourne, Florida* 32901 (DF246500; F19628-76-C-0089)

AF function - weapon systems navigation and delivery. Deficiency - launch site, target position, and geoid uncertainties degrade accuracy of weapons delivery. Objective - combining ground and satellite data to determine geoid form. How research contributes - contractor will use real and simulated satellite altimetry data in combination with land gravity data to determine the geoid form over land areas.

Contractor will modify the Satellite Altimetry and Ground Gravity (SAGG) program to reduce actual terrestrial gravity and satellite altimetry data for geoidal determinations.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory LW, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0005, IMPROVED MODELS FOR COMPUTING THE EFFECTS OF AEROSOLS
UNKNOWN, Univ. of Illinois, Graduate School, *Chicago, Illinois* 60680 (NCA 2-330701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0006, BIOPHYSICAL RESEARCH IN REMOTE SENSING
R.M. HOFFER, Purdue University, Agric. Experiment Station, *Lafayette, Indiana* 47907 (0032384; IND059030)

OBJECTIVE: Determine the capability to identify and map various forest and agricultural features through the utilization of remote multispectral sensing and automatic data processing techniques. Relate spectral response patterns to the physical and chemical properties of the vegetation and soils studied.

APPROACH: Obtain photographic and multispectral scanner data at specific intervals throughout the growing season. Ground truth information concerning type and condition of surficial ground cover will be obtained. Utilize data processing capabilities developed by the Laboratory for Agricultural Remote Sensing to study spectral characteristics of major crop and forest species, soil type, and moisture conditions. Define materials which can and cannot be spectrally distinguished at each period during the growing season. Define wavelength bands of particular utility. Automatically map entire flight lines of data, utilizing training samples. Assess automatic mapping results through the use of ground truth data and aerial photos.

PROGRESS: Significant advances were made in the development of computer-aided analysis techniques of satellite multispectral scanner data. Land use maps and forest cover type maps having reasonable accuracy (75-85%) were derived for areas of rugged mountainous terrain using both LANDSAT and SKYLAB MSS data. Highly significant correlations (conductivity 0 0.93) were obtained when acreage estimates of forest cover based on computer analysis of satellite data were compared to acreage estimates obtained by interpretation of aerial photographs. Detailed analysis of the spectral characteristics of SKYLAB data have clearly shown the importance of the near infrared portion of the spectrum for mapping forest cover types. Satellite scanner data was successfully overlayed onto topographic (elevation, slope, and aspect) data, and new analysis techniques to effectively utilize such data sets are being developed. A seven-date temporal overlay of satellite data for the Hoosier National Forest has been generated and is being analyzed.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0007, IONOSPHERIC ELECTRON CONTENT MEASUREMENTS
Z. HOUMINER, Natl. Comm. For Space Research, Radio Observatory, *Haifa, Israel* (DA0C9422; DAERO 76 G0007)

To undertake continuous monitoring of the total ionospheric electron content (TEC) above Haifa, Israel using the 140 mHz transmissions of ATS-6 satelite. The diurnal, seasonal and solar activity dependence of TEC are to be determined. Data will be used in conjunction with research efforts on navigation systems.

The TEC measurements will be carried out at the radio observatory laboratories at Haifa based on Faraday polarization - rotation techniques using a polarimeter system on loan from ECOM. Data will be transmitted to ECOM.

ADDENDA: Supporting Agency Address is: DARCOM Research and Standardization Group (Europe), Box 65, N.Y., N.Y. 09510

SUPPORTED BY U.S. Dept. of Defense - Army

5.0008, WATER VAPOR LIDAR DEMONSTRATION
T.D. WILKERSON, Univ. of Maryland, Inst. For Fluid Dyn. & Math., *College Park, Maryland* 20742 (NSG 1336)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0009, TOTAL ELECTRON CONTENT STUDIES
J.A. KLOBUCHAR, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244720)

AF function - radio waves which undergo transionospheric propagation suffer a time delay proportional to the number of electrons encountered along the path of propagation. This time delay seriously affects the accuracy of military ranging systems which rely on precise timing to determine target position. Deficiency - present models of ionospheric time delay are data base limited and do not adequately model the behavior of TEC during magnetically disturbed periods when frequently the greatest deviations from average TEC time delay conditions occur. How research contributes - the statistics of the variability of TEC must be determined as a function of geographic location, time of day, season, and state of solar and magnetic activity in order to be able to define and understand this parameter. Relationships to FOF2 and other parameters must be established. additional measurements of TEC time delay at select locations will help in an understanding of the behavior of this parameter as a function of solar and magnetic activity and will result in improved models for AF systems use in correcting for this timing error.

VHF polarization rotation data are taken at ten locations ranging from Greenland to Peru through our in-house and contractual programs and these data are reduced to final TEC values. Studies of these data against F region models are underway. Specific events, such as the TEC response to magnetic storms and solar flares, are studied using a network of stations. Contours of the mean monthly and individual diurnal behavior of TEC over the latitude range from the West Indies to Thule, Greenland have been constructed and are used to determine the F region behavior over the North American region.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory LI, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0010, POWERED BALLOON INSTRUMENTATION AND SENSOR DESIGN AND FABRICATION
A.O. KORN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243960)

AF function - advanced balloon systems (surveillance, reconnaissance, communications, environmental research support). Deficiency - existing instrumentation systems do not meet control and telemetry requirements for evaluation of new superpressure balloons. Objective - design, build and test balloon control and telemetry equipment. How research contributes - the new instrumentation systems will provide necessary controls and accurate telemetry information for evaluation of new superpressure balloons.

Two types of instrumentation systems will be developed for evaluation of superpressure balloon performance, one for the small non- powered balloon tests and a second system for evaluation of powered balloon performance. The systems will be designed to meet the sensor, telemetry, and control requirements unique to each system. Maximum use will be made of existing laboratory equipment assets in the design of both systems. Unique circuitry will be developed and built within the laboratory. The powered balloon instrumentation will be designed to be of general use in free and tethered balloon tests as well as for evaluation of the powered balloon.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory LC, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0011, PROVISIONAL LIQUID WATER CONTENT PROFILES
R.W. LENHARD, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244080)

Air Force function - reentry vehicles for ICBM. Deficiency - underdesign of reentry vehicles may result in damage or destruction during penetration of clouds or precipitation. Objective - to estimate the probability distribution of profiles of liquid water content over USSR. How research contributes - assessment of the reentry environment.

Provisional liquid water content profiles will be produced by a 'first-generation' technique based solely on surface and radiosonde observations. These profiles will be generated from an adequate sample of climatological data for selected USSR locations. Second-generation profiles are being constructed from time cross-sections drawn for one full year of records using all available observational and analytical data. The first- and second-generation profiles for this year of records will be compared for mutual evaluation. The probability distributions of second-generation profiles for the year of records will be interpreted to produce distributions that are climatologically applicable.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory LK L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0012, ION CHEMISTRY IN CLUSTER FORMATION
J.F. PAULSON, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244830)

AF function - aircraft operations in the stratosphere. Deficiency - residence times for engine exhaust products and reactions removing these species from the stratosphere are unknown. Objective - to determine the important reaction channels and reaction rates by which normal stratospheric species and aircraft exhaust species form dimers, trimers, and larger clusters, with emphasis on the ion-neutral reaction channels for clustering.

A double mass spectrometer with a drift tube reaction chamber will be used to study the mobilities of the positive ions of carbon dioxide and of water in air clustering reactions, of these ionic species will be studied at energies close to thermal. Sub-

sequent work will include studies on the clustering reactions of important pollutant species, such as sulfur dioxide and the nitrogen oxides. The roles of other reactions important as sinks for pollutant species will be evaluated.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory LK, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0013, AEROSOL PARTICLE OPTICAL PROPERTIES
F.E. VOLZ, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244300)

AF function - target acquisition and tracking reconnaissance. Deficiency - the performance of optical systems observing through the atmosphere is significantly degraded by absorption and scattering by aerosol particles. Objective - measurements of absorption and refractive index of natural aerosol substances from tropical and continental climates, in the visible and IR spectral range. Measurement of scattering function of nonspherical particles. How research contributes - results will be applicable to the solution of such problems as atmospheric contrast reduction, sky background radiance, propagation breakdown and out of beam scattering of laser radiation. Models of atmospheric transmittance will become more realistic.

Sufficient amounts of aerosol substances are being obtained worldwide by evaporation of precipitation and from high volume air filters. The aerosol substances are separated into dust, soot, and water-solubles, and the latter fractionated into inorganic and organic (alcohol- and benzene-soluble) constituents. In some cases, large and small aerosol particles will be collected separately. Collections will be made by the C-130 project aircraft at altitudes up to 7 km. Absorption spectra of dry substances can be measured by the KBR disk method from 0.25 to 40 microns, and the real part of the refraction index from reflection of disks of pure aerosol substances. Results are to compare with chemical analysis. Experimental problems with the kbr method are to be clarified and comparison of optical measurements on aerosols directly deposited on a substrate are to be made.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory OP, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0014, GEOMONITOR AND IONOGRAM COMPRESSOR
B.W. REINISCH, Univ. of Lowell, Res. Foundatton, *Lowell, Massachusetts* 01854 (DF247460; F19628-76-C-0163)

AF function - communications and detection. Deficiency - prediction and real time specification of the arctic ionosphere. Objective - to produce a geomonitor capable of formatting, partially analyzing and transmitting magnetometer, riometer, polarimeter, scintillation and vertical and backscatter ionosonde data in real-time. How research contributes - provides further progress in remote sensing and continuous monitoring of the high-latitude ionosphere and the auroral oval. The geomonitor will impact on the ability of AWS-SESS to assess and predict geophysical conditions at high latitudes and will play an important role in the AWS/AFCRL environmental specification required during the 4141 OTHB prototype radar system performance tests. The Goose Bay ionospheric data are essential in the Laboratory's research efforts in providing AF systems a model of the arctic ionosphere.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory PH, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0015, GRADIOMETRY DISTURBANCE STUDY
S. JORDAN, Analytic Sciences Corporation, *Reading, Massachusetts* 01867 (DF246040; F19628-76-C-0286)

AF function - form optimal estimates of the disturbance potential and gravity disturbance vector for inertial guidance systems. Deficiency - insufficient gravity sensor tradeoff data. Objective - develop multisensor integration method for combining various sources of geodetic data. How research contributes - develops and implements sophisticated mathematical and statistical theories.

Through the use of the integration method and computer tools developed under the previous contract, contractor will initiate preliminary sensor tradeoff studies for an airborne gravity gradiometry system which also takes advantage of surface gravimetry as well as satellite data.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory LW, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0016, DETECTION OF LEAF BLIGHT OF CORN BY REMOTE SENSING
G.R. SAFIR, Michigan State University. Agric. Experiment Station, *East Lansing, Michigan* 48823 (0059700; MICL01077)

OBJECTIVE: Determine if, by remote sensing, it is possible to detect early stages of infection by Helminthosporium maydis, to distinguish disease produced by H. maydis from disease produced by other organisms, and to detect differences in resistance between different lines of corn or in segregrating populations.

APPROACH: Many different lines of corn will be grown in the greenhouse and inoculated with H. maydis, H. turcicum, Kabatiella zeae, and Phyllosticta sp. and examined daily with remote-sensing equipment. The effect of inoculation methods, resistance, and date after inoculation on the remote sensing data obtained will be determined. Similar experiments will be also performed under field conditions.

PROGRESS: Aerial infrared photography was taken over corn plots suffering from yellow leaf blight. Preliminary analysis indicated that severely blighted plots were distinguishable from healthy plots but were indistinguishable from plots suffering from severe water stress.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0017, CHARACTERIZATION, CLASSIFICATION, GENESIS AND MAPPING OF MICHIGAN SOILS
E.P. WHITESIDE, Michigan State University, Agric. Experiment Station, *East Lansing, Michigan* 48823 (0009329; MICL00319)

OBJECTIVE: Characterize (qualitatively, quantitatively, and geographically) soil taxonomic and soil mapping units throughout Michigan. Classify and name these units to facilitate recall and communication of this information to other scientists and to land users. Determine the genesis of the taxonomic units as a basis for efficient soil mapping and soil management. Foster utilization of this basic soil information in planning and interpreting other research and as a basis for wise land use, and management of soil resources for various purposes in rural, suburban and urban areas. Increase the accuracy and efficiency of soil mapping by use of all pertinent aids, including remote sensing.

PROGRESS: Field work has been continued in Antrim, Bay, Berrien, Clare, Huron, Ingham, Jackson, and Midland Counties. New cooperative soil surveys have begun in Oakland, Lake and Wexford Counties. A soil survey was completed in Gratiot County. Field work on updating of the 1933 Saginaw Co. survey has been completed. The Soil Conservation Service updated the interpretations for the Montcalm County soil survey. Point transects of delineated map units are being used in all cooperative progressive soil surveys to provide more adequate descriptive legends and map unit names. This technique was the basis for updating the 1933 Saginaw County survey. Soils on experimental plots of the Crop and Soil Sciences Dept. (and others as requested) throughout Michigan are identified and delineated. The resulting soil information is finding increasing use in land use planning in rural and suburban areas. Farmland evaluation and recognition of essential future agricultural land resources for food, feed, and fiber production are of particular interest. Land disposal of wastewaters is also contributing to environmental improvement. Preliminary investigations in Jackson Co., MI. indicate the thermal bands of MSS imagery are useful in supplementing aerial photography, particularly in differentiating organic and mineral soil areas.

SUPPORTED BY Michigan State Government - Lansing

5.0018, REMOTE SENSING OF THE ENVIRONMENT
B.O. BENN, U.S. Army, Waterways Experiment Station, *Vicksburg, Mississippi* 39180 (DA0N8025)

To evaluate remote-sensing techniques, existing or under development, for obtaining data relevant to the detection and monitoring of environmental changes induced or sustained by the construction and operation of military facilities, and to provide managers and planners with instructions on how to utilize pertinent methods. Results of the research program will provide managers and planners with guidance for rapid acquisition of data for evaluation of the impact of military construction and base operation activities on the environment. Appropriate technical manuals will be revised or developed to improve master planning and facilities management capabilities by the use of remote-sensing techniques.

Specific data needs for environmental planning and baseline description will be identified in coordination with the Construction Engineering Research Laboratory (CERL). Guidelines for establishing parameters that define the environmental baseline and the effects of a base activity will be developed. Techniques for evaluating the applicability of remote sensing for measuring the parameters will be developed with emphasis on providing the user with a rapid means for optimizing the choice of sensor systems for a specific purpose and under specific conditions in terms of data accuracy, cost, and objective.

ADDENDA: Supporting Agency Address is: OCE Construction Engineering Res. Lab., Champaign, Il. 61820

SUPPORTED BY U.S. Dept. of Defense - Army

5.0019, NUCLEATION AND GLACIATION OF SUPERCOOLED FOG
J. HICKS, U.S. Army, Cold Reg. Res. & Engin. Lab., *Hanover, New Hampshire* 03755 (DA0B8152)

Determine the relationship between the number of ice crystals created by artificial seeding of a supercooled fog and (a) the liquid water content of the fog and (b) the number of water droplets which were present before seeding.

Liquid water content, droplet number, and droplet size distribution will be determined for supercooled fogs which will then be glaciated by the release of compressed air. The number of ice crystals resulting from this seeding will be determined and analysis will be made to see if the number of crystals generated is a function of (a) liquid water content or (b) the number of droplets which were available in the unseeded fog.

ADDENDA: Supporting Agency Address is: OCE Cold Regions Research and Engineering Laboratory, P.O. Box 282, Hanover, N.H. 03755

SUPPORTED BY U.S. Dept. of Defense - Army

5.0020, L. W. RADIATION AND HEAT EXCHANGE IN ICE FOG
T. MCFADDEN, U.S. Army, Cold Reg. Res. & Engin. Lab., *Hanover, New Hampshire* 03755 (DA0A8152)

Develop equations to compute atmospheric and net long wave heat exchange between the open water of a power plant cooling pond and the ice fog above the pond.

Field data will be gathered and prior work reviewed and consolidated. The data will be analyzed and a final report written.

ADDENDA: Supporting Agency Address is: OCE Cold Regions Research and Engineering Laboratory, P.O. Box 282, Hanover, N.H. 03755

SUPPORTED BY U.S. Dept. of Defense - Army

5.0021, POLAR DISTURBANCE EFFECTS
T. TUAN, Univ. of Cincinnati, School of Arts & Sciences, *Cincinnati, Ohio* 45221 (DF242040; F19628-74-C-0008)

AF function - arctic communications, warning systems, space environment. Deficiency - knowledge of physics, chemistry of polar cap. Research - reduce and statistically analyze geophysical data being gathered at the AFCRL Geopole Observatory in Thule, Greenland. How research contributes - provides needed information to categorize polar phenomena, to elucidate physics, chemistry of polar cap. This is of fundamental importance to an understanding of polar cap disturbance phenomena and the possible way in which they may affect communications and warning systems in polar regions.

The following problems are under investigation: (1) the effect of gravity waves on the natural oscillation of the atmosphere taking account of non-linear coupling, (2) a new M.H.F. merging model that does not assume a slow shock wave explicity, and with no artificial separation of the diffusion and field reversal region, (3) analysis of substorms observed at the Geopole Observatory, Thule, Greenland, and (4) continuation of the investigation of the multi-channel scattering approach for atmospheric gravity waves.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory PH, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0022, AIRGLOW AND AURORAL STUDIES OF THE EARTH'S IONOSPHERE
M.A. BIONDI, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (ATM74-22503 A02)

Airglow and auroral phenomena in the earth's ionosphere under normal, naturally disturbed, and artifically perturbed conditions will be investigated with ground-based observations. The observations will be carried out principally at the University of Pittsburgh Airglow Observatory at Laurel Ridge, Pennsylvania, and at the Arecibo Observatory in Puerto Rico. Measurements from NASA's Convair 990 airborne platform may also be carried out. The problems to be investigated include the origin of terrestrial atmospheric sodium, neutral winds in the E and F regions, exospheric temperature studies, and participation in ionospheric modification experiments.

SUPPORTED BY U.S. Natl. Science Foundation

5.0023, AERONOMY OF THE STRATOSPHERE AND MESOSPHERE 12589-GS
L. HALE, Penn. State University, School of Engineering, *University Park, Pennsylvania* 16802 (DA0E8998; DAAG29 75 G0031)

To better understand the composition of the upper stratosphere and mesosphere and the coupling of this composition with the electrical structure of this region and with lower level meteorological parameters. The determination of the composition of the nuclearly undisturbed atmosphere is basic to the prediction of atmospheric effects upon communications, surveillance, and ballistic missile defense systems. The work directly supports research programs at the Atmospheric Sciences Laboratory and the Ballistic Research Laboratories.

The research involves instrumentation, observation, and analysis phases. Measurements of the oxides of nitrogen and the electrical structure of the upper stratosphere and mesosphere will be made using parachute- and balloon-borne probes.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

5.0024, A STUDY OF THE SPATIAL AND TEMPORAL VARIATION OF TEMPERATURE IN THE ATMOSPHERIC BOUNDARY LAYER 11586-GS
J.A. BUSINGER, Univ. of Washington, School of Arts & Sciences, *Seattle, Washington* 98105 (DA0D9198; DAHC04-74-G-0022)

To extend the knowledge of boundary layer turbulent transport processes through a study involving both experimental and theoretical investigations. Better understanding of the structure of turbulence in the layer of air near the ground is important in the prediction of transport, diffusion and concentration of gasses and aerosols, and in the improvement of optical systems. Such systems have diverse military applications ranging from detection and tracking to remote sensing of properties of the earth and atmosphere.

The field research involves use of a computer-controlled real-time data collection and analysis system for measurement of the time and spatial variation of temperature fluctuations, atmospheric stability, heat and momentum fluxes of surfaces of roughness. The theoretical research involves analyses of the tem-

perature data to verify and improve techniques for indirectly obtaining stability, heat and momentum fluxes exclusively from the temperature statistics and gross meteorological parameters over as wide a stability range as possible.

ADDENDA: Supporting Agency Address is: DARCOM Army Rsch Office Research, Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

5.0025, WAVES THROUGH RANDOM MEDIA
A. ISHIMARU, Univ. of Washington, School of Engineering, *Seattle, Washington* 98105 (DF900080; F19628-74-C-0005)

AF function - high data-rate communications. Deficiency - communication frequency bands heavily allocated - new frequency bands are required for high data-rate communications channels. Research - analyze and study propagation and reception of waves, which may be bounded and unbounded in space and may be modulated in time, in turbulence and discrete particles, such as rain or fog, in the atmosphere. How research contributes - the study will contribute to the better understanding of the effects of random media and discrete scatterers on communications, remote probing, and target detection. The fluctuations, correlations, and spectra will be studied for waves which may be multifrequency and wideband, by taking the effects of beam cross-section, wind velocity, particle size, and so on, into account. The study will be applied to remote probing of atmospheric parameters and to detection of targets in random media.

ADDENDA: Supporting Agency Address is: Rome Air Development Center ETE, Griffiss AFB, N.Y. 13440

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0026, ATMOSPHERIC GRAVITY WAVES AND WEATHER
C.R. STEARNS, Univ. of Wisconsin, Graduate School, *Madison, Wisconsin* 53706 (ATM75-14696)

The objective of this research is to establish a seven-station mesoscale network in the Madison, Wisconsin, area to determine the climatology of gravity waves, including their celerity and direction. Other atmospheric parameters will be recorded at the network stations and combined with synoptic, satellite, acoustic sounder and radar data. The significant weather events which occur within and near the mesoscale network will be presented as case studies to determine the possible interactions between the gravity waves and the weather events.

SUPPORTED BY U.S. Natl. Science Foundation

5.0027, MEASUREMENT OF FLUOROCARBONS AND AEROSOLS IN THE ANTARCTIC STRATOSPHERE
D.J. HOFMANN, Univ. of Wyoming, School of Arts & Sciences, *Laramie, Wyoming* 82071 (DPP76-17777)

Four balloon soundings of the stratosphere will be conducted to measure aerosols and fluorocarbons. These data will be used to verify last season's data and to extend the data base to determine, if possible, seasonal and secular trends. Balloon flights will also allow for the observation of the stratosphere surface aerosol layer to assess the effects of volcanic activity. Three scientists will conduct this research during the austral summer 1976-1977.

SUPPORTED BY U.S. Natl. Science Foundation

5.0028, STRATOSPHERIC CONSTITUENTS (PAM)
T.J. PEPIN, Univ. of Wyoming, School of Arts & Sciences, *Laramie, Wyoming* 82071 (DN223438; N00014-75-C-1180)

The objective of this research is to determine reference levels of aerosols in the stratosphere for the purpose of eventually determining the environmental impact of Navy high-performance aircraft on the stratosphere.

This research will involve a solar extinction experiment on a SAMSO satellite to determine globally, or hemispherically, the distribution of stratospheric aerosols. A device will be designed, constructed and flown on a STP satellite to measure solar extinction at various sunrise and sunset angles. The reserve instrument will be modified to become part of the DARPA experimental satellite to be launched in 1978. The resulting data will be processed to show monthly and seasonal values of particulate concentration in the stratosphere.

ADDENDA: Supporting Agency Address is: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, RESEARCH OF PSYCHOACOUSTICAL PROBLEMS MEDICALLY SIGNIFICANT TO ARMY AVIATION
R.T. CAMP, U.S. Army, Aeromedical Research Lab., *Ozark, Alabama* 36360 (DA0D6739)

To provide information about sound which has medical import to U.S. Army aviation.

The approach will be twofold. One will entail the physical description of the critical sound stimuli found in U.S. Army aviation. This will involve descriptions of the generators or sources as well as descriptions of subsequent changes that may be precipitated by various propogating media. The second approach will involve studying the effects of these sounds on human receivers. Both approaches will employ valid research practices.

ADDENDA: Supporting Agency Address is: MD R and D Com. (Army) Aeromedical Res. Lab., Ft. Rucker, Al. 36360

SUPPORTED BY U.S. Dept. of Defense - Army

6.0002, RESEARCH OF BIOENGINEERING PROBLEMS MEDICALLY SIGNIFICANT TO ARMY AVIATION
S.C. KNAPP, U.S. Army, Aeromedical Research Lab., *Ozark, Alabama* 36360 (DA0D6735)

To provide valid, meaningful and medically pertinent information, new designs and equipment developments based on research with respect to immediate field aeromedical problem areas found in U.S. Army aviation.

Approach will always be based on sound and accepted experimental methodology, though particular techniques of application will vary as a function of the problem under investigation.

ADDENDA: Supporting Agency Address is: MD R and D Com (Army) Aeromedical Res Lab., Ft. Rucker, Al. 36360

SUPPORTED BY U.S. Dept. of Defense - Army

6.0003, FATIGUE EFFECTS UPON THE ACQUISITION OF FLYING SKILLS
P.A. IRISH, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222080)

The objective of this study is to quantitatively assess the effects of mission length upon learning piloting skills in simulated flight.

A contact mission profile will be developed and flown in ASUPT by student pilots prior to commencement of their flight training. This mission profile will consist of repeated practice in elementary aircraft control (i.e., pitch, power, and bank). These basic skills will be practiced by attempting straight and level, 30 degree bank turns, constant airspeed (CAS) climbs and descents. Five groups will fly this mission profile for five different time lengths, ranging from 25 to 125 minutes. A criterion maneuver will be presented to each student at the completion of this mission and automated performance measurements will be taken to determine the number of repetitions he requires to achieve a designated proficiency level in the criterion maneuver. The resultant data will be compared to provide estimates of the magnitude and distribution of learning decrement over time. Information provided by this research will be utilized in determining the length of student training missions flown in ASUPT. Full-time work is awaiting the availability of a suitable performance predictor test required by the research design. Efforts are currently underway in attempting to provide this item.

ADDENDA: Supporting Agency Address is: AF Human Resources Laboratory FTS, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0004, DEVELOPMENT AND TEST OF AN AIRCREW SIMULATOR CERTIFICATION PLAN FOR USE IN TAC
L.D. POHLMANN, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222900)

To develop a systematic procedure for obtaining a quantitative measure of the training capability of a training device. The resultant procedure will be used to establish and validate the training effectiveness of both the training device and the program of instruction to be used with the device. Additionally, the program of research should identify and define any policy changes which may be required (i.e., credit for simulator time).

This effort will use as inputs the results of other ongoing research efforts. The general approach of these ongoing efforts will be to (1) identify and define the tasks of a particular aircrew (2) define the criterion reference objectives for these tasks (3) assess which performance objectives may be taught employing the training device (4) develop the instructional program which specifies how the training device is to be used, and (5) validate the resultant instructional program in an operational training setting. Initial efforts will be centered around devices which are presently in various stages of OT&E (F-4E WSTS-18, SAAC, F-15, FSH). This effort will impact these OT&Es as well as other research efforts to insure that such efforts provide usable inputs to the certification project to the maximum extent possible. Attempts to develop a procedure suitable for use with the above devices should provide inputs for the development and refinement of a procedure which has more general applicability.

ADDENDA: Supporting Agency Address is: AF Human Resources Laboratory FTS, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0005, AUTOMATED MEASUREMENT FORMATION FLIGHT TRAINER
G.B. REID, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF221830)

To develop and evaluate a performance measurement system to automate data collection in the Formation Flight Trainer (FFT). The resulting software and data base will be broad enough to be applicable to the formulation of a measurement system for formation flight in the advanced simulation in Undergraduate Pilot Training.

A measurement system will be developed that will model instructor pilot (IP) evaluation. This will be accomplished by testing the ability of both students and IPs to fly the FFT. During these data runs, performance will be recorded by the Automatic Data Acquisition and Control System (ADACS) and two IP evaluators will independently rate performance. The IP data and the combined data base will be used to develop a prediction equation using the IP evaluator grades as a criterion.

ADDENDA: Supporting Agency Address is: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0006, ADVANCED SIMULATION IN UNDERGRADUATE PILOT TRAINING UTILIZATION
J.F. SMITH, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF220510)

Through continuing review and compilation of relevant research results and analysis of available equipment capabilities, to formulate and implement an integrated Division research program which will maximize contributions to the Simulator Usage Data Bank through most efficient use of available resources.

Research issues relevant to increased acceptance and use of simulation will be identified and prioritized. Capabilities of available equipment will be analyzed and research issues which may be addressed with each device will be identified. Specific projects will then be designed and conducted to provide empirically derived data on relevant research issues. These projects will investigate such variables as motion computational techniques and excursion requirements, visual scene content, field of view and brightness, etc., all in terms of their effect on increased training efficiency.

ADDENDA: Supporting Agency Address is: AF Human Resources Laboratory FT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0007, INVESTIGATIONS OF TRAINING METHODS AND INSTRUCTIONAL TECHNOLOGY FOR AF FLYING TRAINING
J. EUBANKS, Arizona State University, Graduate School, *Tempe, Arizona* 85281 (DF221820; F41609-75-C-0028)

To provide a basic research base for studies in instructional technology and to conduct status studies of the current roles of instructor pilots and student pilots.

Arizona State University will be placed under contract to perform studies as detailed in task orders. This approach will permit the exploitation of the research resources of the entire university rather than being confined to a particular department. Areas to be investigated are pre-instructional strategies, cognitive pre training, student stress, multimedia/programmed instruction, and instructor pilot roles for specified flying tasks.

ADDENDA: Supporting Agency Address is: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0008, INVESTIGATIONS OF RACEMIZATION OF AMINO ACIDS IN GEOLOGIC MATERIALS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Hayward, California* 94541 (NCA 2-290704)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0009, EFFECTS OF HEAVY IONS ON OPTIC TISSUES
J.T. LETT, Colorado State University, School of Vet. Med. & Biom. Sc, *Fort Collins, Colorado* 80521 (NSG 9045)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0010, EARLY DETECTION OF ACUTE RESPIRATORY INFECTIONS
A.S. EVANS, Yale University, School of Medicine, *New Haven, Connecticut* 06510 (NSG 2185)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0011, INVESTIGATION OF PSEUDO-ALLELISM AS AN ADAPTIVE MECHANISM
UNKNOWN, Tulane University of Louisiana, Graduate School, *New Orleans, Louisiana* 70118 (NCA 2-800701)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0012, GENERAL AVIATION PILOT STALL/SPIN TRAINING STUDY
UNKNOWN, Aerospace Systems Incorporated, *Burlington, Massachusetts* 01803 (FA58658; FA75WA-3716)

Tasks include: 1. Conduct background investigations and experiments to isolate the weaknesses of present flight training syllabi, the methods of training used, and the flight instruction provided in the stall/spin area. 2. Conceive an experimental stall/spin increment to an established flight and ground training syllabus designed to provide a quantum increase in the student pilot's understanding of the multitudinous implications of near-stall flight and establish the basis for improved flight instruction. 3. Conduct flight and ground test evaluations of this syllabus change and the flight instruction techniques required.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

6.0013, VENTILATORY CONTROL MECHANISMS AT HIGH ALTITUDE (22)
L.G. JONES, U.S. Army, Res. Inst. of Env. Med., *Natick, Massachusetts* 01760 (DA0B6132)

The chemical control of respiration during acute acclimatization to high terrestrial elevation is unclear. A thorough understanding of this aspect of altitude physiology is essential to define new approaches for aiding in adaptation to this environment.

The variables known to chemically control ventilation (arterial PCO sub 2, PO sub2 PH and CsF, PCO sub2 and pH) will be quantitated in man during acclimatization to altitude, as will be the ventilatory response to the stimuli of hypoxia and hypercarbia.

ADDENDA: Supporting Agency Address is: MDRDC Rsch. Inst. of Env. Med., Natick, Ma. 01760

SUPPORTED BY U.S. Dept. of Defense - Army

6.0014, DYNAMIC CHARACTERISTICS OF HUMAN MOTOR PERFORMANCE IN CONTROL SYSTEMS
C. TERZUOLO, Univ. of Minnesota, School of Medicine, *Minneapolis, Minnesota* 55455 (DF040490; AF-AFOSR-2804-75)

AF function - in the design of control systems for aircraft and in other situations where a human operator is involved, it is necessary to know in precise terms the motor characteristics of man's muscular capabilities expressed in the mathematical language of the control system engineer. Deficiency - such data for man are incomplete. No fully adequate predictive model of man's movements is available. Research - this group is developing a model of human motor control with the aid of computers based on neurophysiological experiments. The model will incorporate nonlinearities known to exist in the human central system. How research contributes - the results will be in terms directly useful to engineers designing aircraft controls or other humanly activated controls in Air Force equipment and is applicable to AFSC RO 1.8.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NL, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0015, SIMULATOR TRAINING REQUIREMENTS EFFECTIVENESS STUDY - PHASE ONE - DESIGN
B.W. CREAM, U.S. Air Force, Human Resources Laboratory, *Dayton, Ohio* 45433 (DF228110)

To develop a detailed technical and operational plan for the accomplishment of the Simulator Training Requirements Effectiveness Study (STRES). The objective of STRES is to organize all information bearing upon the cost and effectiveness of each important characteristic of flight simulators. This objective includes determining the nature of the simulation required to meet each specific behavioral requirement for training, indicating most effective techniques for utilizing aircrew training devices, and specifying maximally effective instructional features of such devices. The results of STRES will have a significant potential influence on the procurement and use of aircrew training devices and, in turn, the influence of those devices on the cost and effectiveness of Air Force operations. This is the first of three related work units. The second is to collect and analyze the relevant data. The third is to summarize and report findings for maximum immediate and long-term use.

This work unit has 14 sequential but somewhat overlapping steps. They are: 1. Accomplish coordination/establishment of management team. 2. Categorize task training requirements. 3. Prioritize tasks. 4. Identify/describe variables of interest. 5. Plan data collection/analysis methodology. 6. Identify/describe performance measurement requirements/difficulties. 7. Identify/plan/schedule sites for data collection, subject and responsibiliities of participants. 8. Specify 'operational' data to be collected and individuals/offices to be contacted. 9. Prepare time schedule. 10. Identify/describe Blue Suit vs. Contractor responsibilities. 11. Prepare procurement documentation. 12. Identify/plan preliminary studies. 13. identify/begin literature/documentation analysis. 14. Brief interested agencies. This effort is estimated to require 8-9 months. The management team will be composed of representatives of AFHRL/FT/AS, Simulator SPO, ASD/ENE and the major commands. The results of this work unit will be used to structure and control accomplishment of the total study, and insure that the results will be both highly valuable and appropriate for implementation by responsible agencies.

ADDENDA: Supporting Agency Address is: AF Human Resources Laboratory ASR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0016, AUDITORY RESPONSES TO ACOUSTIC ENERGY EXPERIENCED IN AIR FORCE ACTIVITIES
D.L. JOHNSON, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF313060)

Controlling personnel exposures in the wide variety of usual and unusual acoustic environs of Air Force operations and to control, within acceptable limits, the intrusion of air force noise into residential areas neighboring on air force activities. The continuous growth of Air Force noise problems, currently reflected in higher levels of intensity and more frequency exposures.

Field and laboratory efforts investigate noise-induced hearing loss, personal sound-protective devices, speech interference effects, infrasonic and impulsive signals and subjective reaction to noise. Findings are incorporated into criteria, MIL specs, regulations and guidelines for risk to hearing, adequate voice communication, effective hearing protection, annoyance and operating procedures which minimize adverse effects. Procedures for estimating reactions of individuals and communities to noise exposure are pursued.

ADDENDA: Supporting Agency Address is: 6570 Aerospace Medical Rsch. Lab. BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0017, FIELD STUDY OF C-141A JPA UTILIZATION
R.C. JOHNSON, U.S. Air Force, Human Resources Laboratory, *Dayton, Ohio* 45433 (DF227740)

The objectives of this effort are to determine the impact of job guide manuals (Job Performance Aids for Non-troubleshooting Tasks) on organizational maintenance of the C-141a, the acceptance of the job guide manuals by technicians, and the logistics of using and updating the job guide manuals. The C-141a is the first major USAF system for which job guide manuals have been procured. Plans are to procure such manuals for additional USAF systems. Systematic data about the utility of the job guide manuals for the C-141a is desired by AFSC, AFLC and MAC in order to guide future procurements. The data also are desired for effort under Project 1194 to evaluate technical data for troubleshooting.

A field test for the C-141a JPAs will be conducted at Charleston AFB and Norton AFB. The attitudes toward and acceptance of JPAs by technicians will be assessed by administering questionnaires to and interviewing technicians and supervisors and by observation of maintenance activities. The impact of JPAs on maintenance efficiency will be evaluated by comparing various measures of maintenance efficiency (such as man-hours required to complete a given task) collected before and after introduction of JPAs. Logistic problems resulting from the introduction of JPAs will be assessed through observation and by interview with personnel responsible for maintaining the JPAs.

ADDENDA: Supporting Agency Address is: AF Human Resources Laboratory ASR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0018, CHARACTERIZATION, DETECTION AND MONITORING OF CHEMICAL HEALTH HAZARDS
G.A. KLEINEBERG, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF312700)

To identify and quantitate contaminants and potentially hazardous effluents generated by AF operational and test activities including the products of thermal degradation of chemicals, materials, and propellants. To perform toxic hazard evaluation of these data as they relate to operational exposure of AF personnel and/or environmental impact of use and disposal of such materials. This work is requested by AFSC laboratories, ASD, SAMSO and AFLC.

Thermogravimetry (tg) is used to study chemical stability and degradation rates of AF non-metallic materials used in confined environments. Thermal breakdown products are separated and quantitated by gas chromatography (GC) and identified by mass spectrometry (MS). The methodologies employed are the combined techniques of GC-MS, TG-GC, and TG-GC-MS. Additional analytical methods such as pyrolysis gas chromatography are used to evaluate potential environmental hazards as deemed necessary.

ADDENDA: Supporting Agency Address is: 6570 Aerospace Medical Rsch. Lab. TH, Wright-Patterson AFB, Ohio 45433
SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0019, SPINAL COLUMN RESPONSE TO IMPACT LOADING
G.T. COLLINS, Univ. of Dayton, Graduate School, *Dayton, Ohio* 45409 (DF319600; F33615-76-C-5009)

The objective of this investigation is to define the physical and mechanical characteristics of musculoskeletal tissue to mechanical forces. This investigation is being carried out to collect the material and geometric constants of selected biological tissues to define an interspecies scaling relationship between the squirrel monkey, rhesus monkey, baboon, chimpanzee, and man. These data will be used in the development of new operational design criteria, for establishing engineering specifications, protective countermeasure technology and provide a means of evaluating future support and restraint system design and technology.

Mechanical tests will be conducted on vertebral segment at two different strain rates. Physical property data will be collected on cartilaginous end plates. Dissections will be carried out on 1 squirrel monkey, 1 rhesus monkey, 1 baboon and 1 chimpanzee. Musculature and ligamentous structures shall be identified. The musculoskeletal geometric data will be compared.

ADDENDA: Supporting Agency Address is: 6570 Aerospace Medical Rsch. Lab. BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0020, INFLUENCE OF SPACE FLIGHT ON ERYTHROPOIETIN ACTIVITY AND INHIBITION
J.P. CHEN, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916 (NAS 9-15164)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0021, CARDIAC CHANGES DUE TO ACCELERATION
H.L. STONE, Univ. of Texas, School of Medicine, *Galveston, Texas* 77550 (DF037940; AF-AFOSR-2622-74)

AF function - aircrew personnel operating high-performance aircraft are exposed to increasing levels of rapid onset, sustained, repetitive maneuvering forces. It has been recognized that cardiovascular responses can be encountered which may be particularly important in determining performance and severely limit or restrict the capabilities of the aircrew. Deficiency - the etiology of noted cardiac abnormalities associated with acceleration remains obscure. Accumulated evidence suggests there may be failure of the blood supply to the inner surface of the heart. Miniature swine have been used in a number of acceleration studies since it was determined that they exhibited cardiac pathologies following exposure to high levels of acceleration. There is some question regarding possible species susceptibility. Objective - this effort will define morphological cardiac responses of miniature swine to selected levels of stress. How research contributes - this research is in direct support of RO 1.6 'Mechanical Forces' and supplements ongoing projects at AMD.

Miniature swine will be conditioned through treadmill exercise. These and control subjects will be exposed to acceleration stress and cardiac changes compared.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NL, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0022, MAINTENANCE OF AIR FORCE HUMAN RESOURCES DATA BASE (CONTINUATION)
C.C. FRESNE, U.S. Air Force, Human Resources Laboratory, *San Antonio, Texas* 78236 (DF232750)

Continuation of 63230101 - to collect, document, maintain, and update automated personnel data for Air Force officers, enlisted personnel, and the civilian work force. To organize these data in readily accessible data bases for support of research studies of the personnel system.

Automated standard and command-unique personnel data files will be acquired, edited, and reformatted. Data for all military accessions, flying and technical training, reenlistment and separations, and strength files will be included. Nonautomated documents containing performance and evaluation data will be acquired and converted to machine-compatible form. Milestones - Feb 76 - revalidate requirements for continuing receipt of approximately 30 source files including UAR/UOR active/reserve/ANG (each semiannual), technical training (quarterly), basic military training (monthly), OTS (annual), flying/ navigator training (each annual), etc. Feb 76 - complete processing of Jun 75 OTS historical master file. Mar 76 - complete CY 75 update of basic military training file. Mar 76 - complete processing of Dec 75 UAR/UOR active/reserve/ANG and airman reenlistments and losses files. Mar 76 - complete processing of Jun 75 UOR separated officers file. Mar 76 - complete processing of CY 75 technical training file. May 76 - complete CY 75 preparation of AFOQT data. Sep 76 - complete processing of Jun 76 UAR/UOR active/reserve/ANG data. Sep 76 - complete processing of Dec 75 UOR separated officers file. Oct 76 - complete processing of Jun 76 OTS historical master file. Oct 76 - complete processing of Jun 76 AFROTC applicants/advanced/commissioned losses files.

ADDENDA: Supporting Agency Address is: AF Human Resources Laboratory SMA, Lackland AFB, Texas 78236

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0023, SIGNIFICANCE OF DISEASES OF THE EAR, NOSE AND THROAT (ENT) IN FLYING PERSONNEL
H.H. HANNA, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF311660)

Certain aspects of the flight environment (e.g., barometric pressure changes, oxygen breathing) make normal function of the ENT organs critical to the flyer. The objective of this effort is to determine the incidence and significance to the flyer of ENT diseases, especially those capable to compromising flight safety and/or mission accomplishment, and to establish criteria and methods to permit retention of affected crewmen on flying status.

Specific abnormalities will be selected for study with each effort defined by protocol. Data will generally be accumulated by way of initial evaluation and then follow-up at prescribed intervals. Evaluation of data and conclusions reached, with the aeromedical implication of each, are documented as indicated.

ADDENDA: Supporting Agency Address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0024, SIGNIFICANCE OF METABOLIC DISORDERS IN FLYING PERSONNEL
G.D. HARRIS, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF311500)

There are many metabolic disorders which have been thought potentially to impose risk of sudden incapacitation in flyers, and many others which are known to lead to chronic disease incompatible with flying. This effort is designed to achieve better understanding of the true significance of these disorders in the flight environment to provide the basis for preventing unnecessary removal of crewmen from flying status, and for modifying the long-term effects of diseases in flyers.

Flying personnel referred for aeromedical consultation will be screened and have a prospective followup of metabolic disorders (diabetes, gout, abnormal fat metabolism, obesity, etc.). Relationship of biochemical findings to development of clinical disease states will be evaluated as well as procedures to protect a flyer from developing a disease. Study of trace elements to determine normal limits, metabolic balance, relationship to disease, and value as a diagnostic tool will be employed. Study of peptic ulcer disease in flying personnel will continue. Sub-clinical tropical sprue in USAF personnel returning from sea will be investigated.

ADDENDA: Supporting Agency Address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0025, CONTAMINANT ANALYSIS OF ADVANCED AIRCRAFT OXYGEN SYSTEMS
L.J. LUSKUS, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF315260)

To examine the physiologic consequences of advanced military aircraft oxygen systems including on-board in-flight oxygen concentration and emergency oxygen generation systems, with reference to trace gas contaminants produced in the normal mode of operation as well as in various overload conditions.

The first flight prototype Open Loop Oxygen Generating System (OLOGS) being developed for the B-1 aircraft will be tested for contaminant off-gassing and human physiologic compatability under simulated flight profiles. Studies will also be initiated to determine the odor threshold of chlorine in oxygen to establish standards for chlorate-based emergency oxygen generators.

ADDENDA: Supporting Agency Address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0026, INVESTIGATION OF THE EFFECT OF ATMOSPHERIC AND BAROMETRIC CHANGES ON ORAL HEALTH IN FLYING PERSONNEL

A.S. WINDELER, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF312130)

The objectives of this effort are to determine the effects of variation in atmospheric pressure and composition on the teeth and other tissues of the mouth, to determine the cause of pain in the teeth occurring at altitude (barodontalgia) and to develop means for preventing its occurrence.

Altitude chamber subjects will be monitored over a long period in order to treat any dental complications which might arise. Detailed case histories will be recorded. In cases of barondontalgia, subjects will be returned to altitude after treatment in order to determine if treatment was successful. In an effort to determine a method to predict the occurrence of barodontalgia, a protocol has been submitted to investigate the effects of barometric pressure on interpulpal pressures and circulation. Canines will be used for this study. It is hoped that this study will either prove or disprove current theories concerning barodontalgia.

ADDENDA: Supporting Agency Address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0027, BIOTHERMAL COMPUTER RESEARCH FOR PREDICTION OF AIRCREW RESPONSE TO THERMAL EXTREMES

A.C. BROWN, Univ. of Washington, School of Medicine, *Seattle, Washington* 98122 (DF316730; F33615-72-C-1237)

This contract is an effort to define and model aircrew and ground crew response to thermal stress to predict the thermal strain produced by Air Force operational environments. Its results will enable ready selection of design criteria for thermal protection of air and ground crews in manned weapons systems and support software. It will create a physiological data base for weapons systems designers to use in computing hardware/software tradeoffs. The work to date has been the construction of a comprehensive biothermal model based on known physiological and physical control of heat distribution in the body and on data in the existing literature.

The work under this contract will improve this model and adapt the model for use on a typical minicomputer, this will allow easy use of this tool by any interested Air Force research organization, as well as its modification for use in solving special purpose operational problems.

ADDENDA: Supporting Agency Address is: 6570 Aerospace Medical Rsch. Lab. EM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0028, MEASUREMENT OF POWER DISTRIBUTION AT RESONANT AND NONRESONANT FREQUENCIES IN EXPERIMENTAL ANIMALS AND MODELS

A.W. GUY, Univ. of Washington, School of Medicine, *Seattle, Washington* 98122 (DF318740; F41609-76-C-0032)

High-level national concern over adequacy of existing RF safety standards have highlighted the need to be able to accurately define experimental exposure fields, insure inter-comparability of power deposition and mechanism of measured distributions in experimental animals. This effort will investigate ground plane and position effects on power absorption in several man models at U. Washington and at USAFSAM/RA. To intercompare field measurement techniques used at U. Washington and those used at USAFSAM, together with comparison of theoretical and measured distributions in experimental animals exposed in both facilities. To design and construct an exposure system for cell or tissue cultures when fields within culture can be exactly specified. To demonstrate utility of the culture system by exposing freshly isolated primate lymphocytes with and without stimulating antigens.

University of Washington personnel are to bring thermographic equipment and field measurement devices to USAFSAM to compare their measurements with those at USAFSAM. Killed animal models and physical models are to be examined after exposure to a variety of frequencies at USAFSAM and U. Washington including the HF band coax, near-field synthesizer and U. Washington resonant cavity, was well as provisional examination of the fields generated by the multiple frequency exposure apparatus at SAM. An exposure cell is to be constructed from readily available materials and its utility demonstrated by exposure of freshly isolated lymphocytes to fields calculated for an equivalent field in man models exposure to a variety of field geometries.

ADDENDA: Supporting Agency Address is: USAF School of Aerospace Medicine RA, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, NUMERICAL METHODS FOR PREDICTING HIGH REYNOLDS NUMBER FLUID FLOWS

A.J. CHORIN, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (DN223123; N00014-76-C-0316)

The development of reliable procedures for numerically solving the Navier-Stokes equations will lead to accurate predictions of the flows about aircraft, ships, and missiles, and, consequently, to much better methods for optimizing their performance. The purpose of this research is to develop techniques for solving the Navier-Stokes equations by transcending the limitations of present finite-difference techniques which are restricted to relatively low Reynolds number flows.

In the numerical solution of the Navier-Stokes equations by finite- difference procedures, the grid size in the high shear regions must decrease as the Reynolds number increases to prevent truncation errors from becoming overwhelming. This restriction rapidly becomes a prohibitive one because of excessive computing time. In practice, this limits calculations to low Reynolds numbers. The proposed research will attempt to overcome this severe restriction. For relatively high Reynolds numbers, the flow field will be decomposed into a smooth flow in which vortex blobs are imbedded. These vortex blobs are generated at solid boundaries. The flow is determined by following the dispersal of the blobs throughout the flow until convergence, in some mean sense, is reached.

ADDENDA: Supporting Agency Address is: Office of Naval Research 438, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

7.0002, CONSTRUCTIVE AND COMPUTATIONAL TREATMENT OF PARTIAL DIFFERENTIAL EQUATIONS

R.P. GILBERT, Univ. of Delaware, Graduate School, *Newark, Delaware* 19711 (DF041300; AF-AFOSR-2879-76)

The Air Force has a need for effective numerical and computational techniques for the design of future aerospace vehicles. It is important to have powerful techniques for performing 'a priori' analysis of the physical capabilities of the vehicle considering the minimization of weight, size, as well as other physical characteristics and the maximization of strength of its structural components. In addition, the design must consider the development of

aerodynamic components which perform efficiently throughout the spectrum of flight environment conditions. This research project examines some critical mathematical problems for which the present computational techniques are not adequate. A number of boundary value problems involving elliptic as well as parabolic partial differential equations arise in the design of aerospace vehicles. For example, they arise in the analysis of elastic shell structures, fluid flow over aerodynamic surfaces, and in the study of heat transfer to the boundary layer. One important problem area is the handling of complicated boundary conditions. Various approaches are investigated under this grant. The use of splines and linear programming techniques to approximate boundary conditions, the conversion of a boundary value problem into an integral equations problem, the use of the Galerkin method with finite elements, the reproducing kernel procedure are some of the areas of investigation. Importance will be given to the association of this research to problem areas of interest to the AF, the development of usable computational techniques, the anlaysis of errors in the computational methods and the conduction of computer experiments to test such methods.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NM, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

7.0003, ASSESSMENT OF RELIABILITY AND COST-BENEFIT MODELS FOR FAULT-TOLERANT AIRBORNE COMPUTING SYSTEMS
D. GROSS, George Washington University, School of Engin. & Appl. Sci., *Washington, District of Columbia* 20006 (NSG 1338)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0004, INVESTIGATION IN NONLINEAR MECHANICS 11600-M
W.S. LOUD, Univ. of Minnesota, School of Mathematics, *Minneapolis, Minnesota* 55455 (DA0D9150; DA-ARO(D)-31-124-73-G199)

To investigate the stability and branching of nonlinear equations. The class of differential equations considered occur in the analyses of dynamical and vibrational systems. The proposed investigation is particularly relevant in the study of nonlinear control problems associated with weapon systems and in the study of stability of large deformations of structures like those incountered in aircraft.

Areas of research will include: (1) Study of stability regions of ordinary differential equations. (2) Further study of implicit function theorem with reference to branching of solutions of differential equations. (3) Application of branching theory to boundary value problems other than periodic solutions. (4) Study of generalized inverses of differential operators.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

7.0005, ORDINARY DIFFERENTIAL EQUATIONS - OSCILLATION AND STABILITY THEORY 13610-M
W. LEIGHTON, Univ. of Missouri, Graduate School, *Columbia, Missouri* 65202 (DA0E9070; DAAG29 76 G0206)

To study approximation of conjugate, focal, and sigma points for second order differential equations. Eigenvalues play a crucial role in the study of optimal control problems associated with weapon systems and in the stability analysis of vibrating structures such as rotating helicopter blades. Estimation of zeros, conjugate and focal points of differential equations will, therefore, contribute to efficient computational procedures for such quantities.

The effects on such points of perturbation of coefficients of differential equations will be investigated.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

7.0006, AIR/SEA INTERACTION ANALYSIS APPLIED TO SEASAT DATA ALGORITHM
M.I. HOFFERT, New York University, Graduate School, *New York, New York* 10003 (NSG 5133)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0007, INVESTIGATION OF NUMERICAL METHODS FOR USE IN REAL-TIME SIMULATION
R.L. BROWN, Univ. of Virginia, Graduate School, *Charlottesville, Virginia* 22903 (NSG 1335)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, SPECTROSCOPY OF HIGHLY IONIZED ATOMS
S. BASHKIN, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (DN023294; N00014-75-C-0499)

The Navy needs data on the properties and radiations of highly ionized atoms which affect communications or surveillance systems. Such ions are produced by nuclear explosions, solar phenomena, laboratory plasmas, nuclear weapon simulation, and high-velocity projectiles in the atmosphere. This research provides a unique source of data on ionized species.

Using the techniques of beam foil spectroscopy, the investigator will continue research on radiations from heavy multiply charged ions. Wavelength regions to be studied include the visible, ultraviolet, and x-ray. Increased efforts will be made to make careful charge state separations of radiations from various heavy ions. The investigator will continue to develop and improve new techniques for making measurements on ions produced by the beam foil source. This will include those methods which result in determination of new atomic parameters, improved spectral resolution, reduced uncertainty, and better identification of spectral lines.

ADDENDA: Supporting Agency Address is: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

8.0002, RESONANCE STUDIES OF SUPERIONIC CONDUCTORS
V. JACCARINO, Univ. of California, School of Letters & Science, *Santa Barbara, California* 93106 (E(04-3)-34,0244)

A combined nuclear magnetic resonance (NMR) and electron paramagnetic (EPR) study of certain superionic conductors and related ionic compounds is proposed. The novel features of the projected work include (1) using magnetic ions as a probe of activated motion, (2) using the fast decay of the electronic spin correlation functions in magnetically dense compounds to probe activated hopping in the 10-11 - 10-12 sec. time domain and (3) the possible use of EPR as a means of studying electrode-electrolyte interfaces. The specific systems to be studied include: F19 NMR in KMnXMG1-x and in Mn-doped PbF3, EPR of ion interchange in rutile structure crystals and EPR of electrolyte surfaces.

SUPPORTED BY U.S. Energy Res. & Dev. Admin. - P.R.D.

8.0003, THEORETICAL PARTICLE PHYSICS AND THEORY OF PHASE TRANSITIONS
M. NAUENBERG, Univ. of California, Graduate School, *Santa Cruz, California* 95060 (PHY76-18598)

Research in field theory and statistical mechanics initiated under NSF grant PHY74-05906 AO2 will continue. Renormalization group and lattice techniques will be applied to solve basic problems in phase transitions and in the Reggeon field theory. Semi-classical soliton structures in the non-Abelian gauge theory of quark interactions will also be studied. In particle physics, this

research will seek to elucidate the Pomeron (no-quark) exchange mechanism, as well as to explore several areas in strong and weak interaction phenomenology.

SUPPORTED BY U.S. Natl. Science Foundation

8.0004, A COMPREHENSIVE EXAMINATION OF ION ACOUSTIC WAVES IN MULTI-ION COMPONENT PLASMAS
J.M. TURNER, Morehouse College, Graduate School, *Atlanta, Georgia* 30314 (NSG 8043)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0005, MATERIALS SUPPORT TECHNOLOGY - SYNTHESIS OF HIGH TRANSITION TEMPERATURE A15 SUPERCONDUCTORS BY MEANS OF ION IMPLANTATION
R.M. ROSE, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DN675156; N00014-76-C-0297)

The objective is to characterize the composition and study the properties of high transition temperature A15 superconducting materials which are prepared by means of ion implantation. These materials are of direct interest to the Navy in superconduction devices for use in its communications, data processing and ASW systems.

Substrates of Nb3Al will be prepared, characterized and implanted with Si ions at various dosages and energies. The composition, depth, thickness and crystalline order of the implanted layers will be characterized by means of X-ray diffraction and electron microscopy. Specimens will be annealed under various conditions and studied for evidence of epitaxial growth and/or substitution. Measurements of transition temperature and other superconducting properties will be made as a function of implantation temperature and initial specimen preparation.

ADDENDA: Supporting Agency Address Information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

8.0006, PRODUCTION OF HIGH-DENSITY UNIFORM FLOWING PLASMAS
R.M. PATRICK, Avco Corporation, *Everett, Massachusetts* 02149 (DF029150; F44620-75-C-0025)

Ballistic missile defense and surveillance require advanced, efficient, high-powered flowing gas laser weapons, illuminators and radar devices for airborne and space vehicles. This research responds to RO 5.3 and 6.3 and will aid in understanding and controlling the complex mechanisms involved, and in engineering design and development of these advanced electric lasers and MHD generators. This program encompasses investigations aimed at producing stable, uniform, high-density plasmas with emphasis on studying stability of the plasma produced, including connection between attachment and acoustic instability and arcing. Diffuse electron beams will produce a uniform volumetric ionization, electric fields will control the electron temperature, recombination rate, attachment rate and molecular excitation rate. Broad-area electron beams will be created and injected into a discharge chamber containing a static or flowing gas. The plasma emission spectra, plasma conductivity and local electric field in the discharge will be measured. A theoretical model of the plasma based on experimental results will be formulated to describe and predict its properties, especially regions of instability and relationship between attachment and acoustic instability and arcing.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

8.0007, AERODYNAMIC AND ELECTROMAGNETIC PROPERTIES OF PLASMAS
L. CESARI, Univ. of Michigan, School of Lit. Sci. & the Arts, *Ann Arbor, Michigan* 48104 (DF032420; AF-AFOSR-2122-71)

Shock-ionized flow fields can cause severe degradation of radio signals, in particular during the launch and reentry portions of a trajectory, sometimes described as the ionized rocket plume and plasma sheath problems. Changes in attenuation, modulation, polarization, coherence, and the linearity of the radio waves, caused by such shock- ionized plasmas, have serious effects on communications, countermeasures, radar, guidance and navigation systems. The central goal of this research program is the determination of more accurate solutions of the aerodynamic and electromagnetic problems associated with the plasma sheath. This includes the examination of functional analytical techniques for the study of nonlinear wave equations, the determination of canonical forms for nonlinear hyperbolic partial differential systems, the examination of a reduced form of Maxwell equations for the nonlinear oscillations of plasmas and nonlinear optic and radio waves, the examination of magnetohydrodynamic channel flow, the examination of certain related questions concerning magnetohydrodynamic shock waves, the examination of the structure problem for these waves, the examination of certain equations of gas dynamics, and the examination of the mixed problem for linear hyperbolic systems in regions containing a multiple corner.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NM, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

8.0008, PLASMA ACCELERATION PROCESSES IN PULSED ABLATIVE ARC DISCHARGES
D.J. PALUMBO, Fairchild Space & Elect. Co., *Farmingdale, New York* 11735 (DF038660; F44620-74-C-0055)

Af function - satellite surveillance, communications and navigation, advanced electric propulsion engines. Deficiency - insufficient understanding of low-temperature plasma generation and acceleration mechanisms and exhaust plume properties associated with arc jet ablative plasma thrusters and lack of realistic guidelines for predicting propulsion systems performance and plume interaction effects. Objective - to understand and develop accurate theoretical and mathematical models realistically describing the plasma generation and acceleration phenomena and plume characteristics associated with pulsed ablative arc plasma discharges (i.e., pulsed ablative thrusters). How research contributes - will provide additional understanding and realistic analytical modeling of the unsteady plasma generation and acceleration processes via ablative arcs and the accompanying exhaust plume characteristics and will continue to establishing realistic design criteria for development of better pulsed ablative plasma thruster devices with desirable plume characteristics.

Theoretical and experimental studies of plasma acceleration processes in pulsed ablative arc discharge will be carried out. Initially, a 1-D, unsteady continuum model will be formulated approximating the plasma as a perfect fluid with finite electrical conductivity, but zero viscosity and thermal conductivity. Subsequently, a quantitative 2-D, unsteady analytic model will be formulated in which the effects of finite viscosity and thermal conductivity will be incorporated so that electrode boundary layer phenomena and local degradation of the ablator can be analyzed. Finally, real fluid effects, to include finite rate chemistry and thermodynamic nonequilibrium will be introduced for a more accurate mathematical description of the plasma. Concurrently, salient plasma parameters will be measured including magnetic flux density, local current density, electron density and temperature, and luminous front velocity as functions of time and space. Theoretical and experimental efforts will be coordinated and the results used to determine the complex wave interactions present and to evaluate the consistency of the analytic model. The technique will be extended to treat the chemical composition and structure of the exhaust plume.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NA, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

8.0009, MOLECULAR DYNAMIC SHOCK-WAVE STUDIES IN SOLIDS 10943-C
A. PASKIN, City University of New York, School of Liberal Arts & Sci., *Flushing, New York* 11367 (DA0D9108; DAHC04-75-G-0139)

To study the propagation of shock waves in a three-dimensional solid using molecular dynamic techniques. Shock physics is quite relevant to the Army explosive research effort. In addition, a better understanding of the shock wave phenomenon in structures of interest to the Army, such as gun tubes and projectiles, will lead to better design features. Results of this study could also be relevant to the noise reduction problems in helicopters.

Molecular dynamic techniques will be used to simulate planar shock waves in a three-dimensional solid. Pressure, local density, temperature and atomic positions will be monitored as the shock wave progresses through the solid. Iron (B.C.C.) will be simulated and the shock waves will be oriented in the (111) and (100) directions. The kinetics of phase changes will be studied. The role of point and line defects on shock wave propagation will be studied.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

8.0010, PROBLEMS IN SOLID-STATE THEORY - (OPTICS AND S-W SUPERCONDUCTORS) 12665-P

J. BIRMAN, City University of New York, School of Liberal Arts & Sci., *New York, New York* 10031 (DA0C5571; DAHC04-75-G-0052)

(1) To develop improved quantitative and predictive microscopic theories of crystal optics for improved selection of optical components as well as using the microscopic phenomena selectively for diagnostics and novel signal-processing techniques. (2) To obtain further clues as to why the beta-tungsten compounds have so far produced the highest but not high enough superconducting transition temperatures. Relevance - the microscopic polariton theory is relevant to optical signal- processing techniques (e.g., possibly to a miniaturized optical radar in the 10 micron region) and surface polaritons may be used as a diagnostic tool to study interface states of MOS type devices. Beta-tungsten compounds are the best candidates at this point for high T sub C windings in superconducting generators and motors under consideration by MERDC. Any enhancement of T sub C which may result from an understanding of the relation between lattice instabilities and the onset of superconductivity in these materials will improve the feasibility of such applications.

(1) To develop quantum mechanical theories of crystal optics for nonlocal phenomena producing 'spatial-dispersion' involving excitons, phonons, polaritons, resonance Raman and Brillouin scattering, effects of stacking faults. (2) To investigate specific features associated with the superconducting phase transition, such as lattice instabilities, lattice dynamics, symmetry changes, pressure and magnetic field effects, phonon scattering mechanisms.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

8.0011, INVESTIGATION OF THE TOPOGRAPHICAL FEATURES OF SURFACE CARRIER CONCENTRATIONS AND LIFETIME DETERMINATIONS IN SILICON SOLAR CELLS

F. POLLAK, Yeshiva University, Graduate School, *New York, New York* 10033 (NSG 3123)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0012, IMPROVEMENT OF GAAS CRYSTAL QUALITY

W. TANTRAPORN, General Electric Company, *Schenectady, New York* 12305 (DF044500; F44620-76-C-0127)

AF function - microwave solid-state electronic devices are essential components of Air Force surveillance, electronic countermeasures, and communications systems. Deficiency - the performance of GaAs microwave devices is being limited by the poor quality of the GaAs substrates used in the epitaxial growth process. The high defect density of these substrates causes high noise in microwave field-effect transistors and possible complete failure in Impatt devices. Objective - the objective of this research is to develop a method of growing GaAs boules which will consistently and uniformly yield GaAs substrates of a quality superior to that now available. How research contributes - an improved substrate material will allow GaAs microwave devices to achieve higher performance levels than those now possible and thus enhance Air Force systems employing these devices.

The main idea behind this research lies in the fact that most GaAs substrates available today are grown by methods, Bridgman or Czochralski techniques, in which the liquid-solid interface is liquid-convex. This configuration leads to defect migration from the surface into the bulk of the ingot and hence concentrates the number of defects in the main part of the boule. In addition, since solid GaAs is less dense than the liquid, the liquid-convex surface results in high compressional strain, another defect source in GaAs. In this research temperature gradients from a specially designed furnace will be used to control the liquid- solid interface and obtain a solid-convex surface. This interface shape will help to propagate defects out of the bulk and also aid in the reduction or possible elimination of compressional strain. The defects of slices in the boule will be determined by etch-pit density counts. The etch-pit density will be correlated with various radii-of-curvature for the solid convex surface.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NE, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

8.0013, FLUX PINNING AND FLUX FLOW STUDIES IN SUPERCONDUCTORS USING FLUX FLOW NOISE TECHNIQUES

W.C. JOINER, Univ. of Cincinnati, School of Arts & Sciences, *Cincinnati, Ohio* 45221 (BER-76-275; E(11-1)2836)

OBJECTIVE: The objective of this work is to study flux pinning and the dynamics of flux flow in Type II superconductors. Superconducting alloy samples will be prepared containing various metallurgical defects and exhibiting different critical current characteristics resulting from the defect structure. The flux flow noise power spectrum will be studied for each sample, and data will be obtained which will relate flux bundle size, transit time, pinning force, and other parameters characterizing flux flow with the metallurgical sample condition.

PROPOSED PROCEDURE: Measurement of the flux flow noise spectrum as a technique for obtaining information on flux flow properties of superconductors was first suggested by van Gurp in 1966. Use of this technique has not been fully exploited, however, because workers who have reported measurements using this method have obtained results contradictory with the existing theoretical descriptions. However, preliminary measurements we have made in PbIn foil samples appear to produce a coherent picture of the flux flow process.

We believe this technique may be developed as a means of studying in a detailed way the desirability of new superconducting materials and improving the uniformity, and therefore the reliability, of long lengths of wires required in large-scale devices.

SUPPORTED BY U.S. Energy Res. & Dev. Admin. - B.E.R.D.

8.0014, DIPOLAR DEFECT STRUCTURE OF LASER AND OTHER TRANSPARENT MATERIALS 13440-P

D. SCHUELE, Case Western Reserve Univ., Graduate School, *Cleveland, Ohio* 44106 (DA0E9113; DAAG29 76 G0222)

To discover and identify dipolar relaxation phenomena in alkaline earth fluorides and semiconductors and develop an understanding of the mechanisms involved. Relevance - the U.S. Army Metrology and Calibration Center is attempting to develop stable and accurate pressure transducers to replace dead weight piston gauges in Army calibration laboratories throughout the world. This research may lead to near zero temperature- coefficient materials by use of a straightforward doping technique which will advance that effort.

The dielectric constant and dissipation factor will be measured as a function of temperature, pressure, and frequency for solid dielectrics containing dipolar entities. The effect of the addition of dipoles to materials on the temperature coefficient of capacitance will be investigated.

ADDENDA: Supporting Agency Address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

8.0015, ATOMIC COLLISIONS AND PLASMA PHYSICS 11166-P
M.A. BIONDI, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (DA0D9068; DAAG29 76 G0019)

To advance the understanding of ion-electron recombination rates of atmospheric species, atmospheric ion-molecule reaction rates and mechanism of electron-ion recombination. This research is directly relevant to the ballistic missile defense work at BRL, and has the potential for contributing parameters for studies of laser propagation in the atmosphere.

Research will consist of: (a) measurements of electron-ion recombination rates under conditions duplicating the normal and artificially perturbed ionosphere, (b) measurements of ion-molecule reaction rates which affect the identities and concentrations of positive and negative ions in the various ionospheric regions, again for normal and perturbed conditions, and (c) studies of the basic mechanisms of electron capture by positive ions to provide improved understanding of basic processes, guidance for theoretical calculations, and new measurement techniques.

ADDENDA: Supporting Agency Address is: DARCOM Army Rsch. Office, (Aro-D), Research Triangle Park, N.C. 27709

SUPPORTED BY U.S. Dept. of Defense - Army

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, MANPOWER IMPLICATIONS IN THE DESIGN OF AIR FORCE EQUIPMENT
M.L. RITCHIE, Wright State University, School of Science & Engin., *Dayton, Ohio* 45431 (DF037400; AF-AFOSR-2569-73)

AF function - the AF must provide an improved methodology for estimating and controlling manpower costs involved in the acquisition and operation of new systems. Deficiency - there are no currently available models or methods for forecasting the personnel and training costs of new systems, and no techniques for estimating the manpower costs of engineering design trade-offs. Objective - this research will identify characteristics of the systems engineering design process that can be manipulated to reduce the personnel and training components in the life-cycle costs of major aero systems. How research contributes - this study will support the program of the Human Resources Laboratory that is undertaking a major thrust to develop effective methods for the reduction of personnel costs in systems acquisition and operation. The research relates to RO's 1.1, 1.2 and 1.4 and the results will be directly used in high priority laboratory programs that support objectives of ASD and the Flight Dynamics Program of AFWAL.

The research will methodically review and/or define such variables as support manpower figures in life-cycle costing, the use of contractor warranties in Air Force equipment acquisition, the assignment of values in trade studies, the nature and influence of work statements on equipment design, and the analysis of manpower costs in life-cycle costing.

ADDENDA: Supporting Agency Address is: AF Office of Scientific Research NL, Bldg. 410, Bolling AFB, D.C. 20332

SUPPORTED BY U.S. Dept. of Defense - Air Force

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SOLAR AND PLANETARY VARIATIONS
G.W. LOCKWOOD, Lowell Observatory, *Flagstaff, Arizona* 86001 (ATM76-17405)

Titan, largest satellite of Saturn (and the only solar system satellite known to have an atmosphere), Uranus, and Neptune, were observed photoelectrically in the blue and yellow spectral regions at the Lowell Observatory in Flagstaff, Arizona, from 1971 to 1976. During this period, they brightened steadily at differing rates averaging nearly one percent per year. There is no satisfactory explanation for the brightening. All of the observations, made differentially with respect to nearby stars, were corrected for effects of changing distance of the earth and planets from the sun. The implications for the terrestrial radiation budget are profound if the earth's brightness, as seen from space, changes in a similar fashion. Alternately, it is possible that the solar energy output is changing which would also have interesting implications in terms of climatic change.

This grant continues planetary and satellite observations for two more years, from 1976 to 1978. During this time solar activity will rise from minimum to near maximum and it may be possible to establish a correlation between solar activity and planetary brightness changes. The same telescope, auxiliary equipment, and observational techniques will be used for the new observations, ensuring homogeneity of the measurements. New filters will be added for observations in the ultraviolet and red spectral regions. The planetary satellites Rhea (Saturn 5), Europa (Jupiter 2), and Callisto (Jupiter 4) will be added to the program. Unlike Titan, Uranus and Neptune, these satellites have solid visible surfaces composed of ices and low-albedo minerals. The presence or absence of brightness changes in these satellites will help determine if previously observed changes are principally related to solar radiation itself, or represent changes in the albedos of planetary atmospheres caused in some way by the sun.

SUPPORTED BY U.S. Natl. Science Foundation

10.0002, RESEARCH INTO THE THEORY OF STELLAR STRUCTURE AND EVOLUTION
R.K. ULRICH, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (AST76-20260)

A range of topics concerned with gas dynamics, stellar structure and stellar evolution will be studied. The question of the nature of the T Tauri star phenomenon will receive special attention. The infall model for the T Tauri spectral emission will be developed to the point where detailed comparisons to the observed spectrum can be made. The dynamics and physical processes involved with mass transfer in binary star systems will be studied in an effort to find progenitors for the binary X-ray sources. Other topics to be studied are: the spectral emission from the hot spot in cataclysmic variable stars, solar models with inhomogeneous initial chemical composition, the relation between solar envelope structure and non-radial oscillation frequencies, instabilities in evolved stars, and the carbon, nitrogen anomalies in some O and B stars. This research will add to our knowledge of star formation, stellar structure and stellar evolution.

SUPPORTED BY U.S. Natl. Science Foundation

10.0003, SOLAR RADIO RESEARCH
R.N. BRACEWELL, Stanford University, School of Engineering, *Palo Alto, California* 94305 (DF242410; F19628-74-C-0053)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate solar disturbance predictions. Objective - observation of the radio emission of solar flares, the slowly varying component of active regions and solar limb brightening. How research contributes - development of accurate techniques for predicting these disturbances. This research effort involves an observational and interpretive program to investigate solar radio bursts at the 3 cm wavelength and to determine their relationships to the overall flare processes. The work has direct bearing on solar flare studies under project 7649 - Solar Environmental Effects - being carried out at the Sacramento Peak Observatory.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory PH, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0004, ATMOSPHERIC INVESTIGATIONS/ATMOSPHERIC ENVIRONMENT OF MILITARY SYSTEMS/ATMOSPHERIC RESPONSE TO INCOMING RADIATION

M.G. HEAPS, Natl. Res. Council, *Washington, District of Columbia* 20037 (DA0M4528)

To model mathematically the response of the atmosphere to incident radiation from the sun or outer space and to compare calculations with measurements. The results will be used to improve models of atmospheric deionization and atmospheric reionization following nuclear bursts and to improve atmospheric models in phenomenological computer codes for BMD and communication systems. Section 9 of the Army qualitative research requirements for nuclear weapons effects information (QRR) documents the requirements for the research.

The response of the atmosphere to previous solar eclipses will be investigated and used as a guide for predicting the atmospheric response during the forthcoming eclipse over the northern United States and Canada on 26 Feb 79.

ADDENDA: Supporting Agency Address is: DARCOM Ballistic Research Labs., Aberdeen PG, Md.21005

SUPPORTED BY U.S. Dept. of Defense - Army

10.0005, NAVIGATION - ACCURATE POSITIONS OF SOLAR SYSTEM OBJECTS

P.M. ROUTLY, U.S. Navy, Observatory, *Washington, District of Columbia* 20390 (DN046002)

Observations of solar system objects such as the planets, and satellites of planets, asteroids and comets constitute fundamental input to navigation, communication and celestial prediction in which the Naval Observatory has a Department of Defense-directed requirement.

Observational program is carried out with a 15-inch astrograph, a twin 8-inch astrograph, a 61-inch and 40-inch reflector telescope to obtain data on the positions and motions of comets, planetary satellites, and a selected list of asteroids.

ADDENDA: Supporting Agency Address is: Naval Observatory, Washington, D. C. 20390

SUPPORTED BY U.S. Dept. of Defense - Navy

10.0006, STUDY OF THE EVOLUTION OF SOLAR ACTIVE REGIONS

R. KASTEN, Washington Technical Institute, Undergraduate School, *Washington, District of Columbia* 20008 (NCA 5-63)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0007, THEORETICAL STUDY OF SOLAR WIND-MAGNETOSPHERE INTERACTIONS AS RELATED TO GEOMAGNETIC STORM ACTIVITY

I. LERCHE, Univ. of Chicago, Graduate School, *Chicago, Illinois* 60637 (DF243330; F19628-75-C-0101)

AF function - communications. Deficiency - lack of knowledge to predict magnetic fluctuations and other effects resulting from the interaction of the solar wind with the magnetosphere, and the accompanying changes of neutral-particle and plasma densities at satellite altitudes. Research - study of interactions between plasmas and magnetic fields. How research contributes - theoretical studies concerning the dynamical interaction of the solar wind with the magnetosphere will provide input parameters for the construction of an improved magnetospheric model relating the quality of communications to geomagnetic activity. The possibility of a large drag on the boundary layer between a warm streaming plasma and a magnetic field, the stretching of the lines of force into the tail region of the magnetosphere, and the very existence of the tail will be examined in order to develop a magnetospheric model which will best satisfy observed phenomena.

The principal investigator will study the basic plasma physics underlying the existence and maintenance of magnetic fields so as to better understand both the large-scale magnetic fields seen in the earth, the sun, and solar wind, and their turbulent 'noise-like' fluctuations. It is rapidly becoming clear that when an ionized medium is moving between an emitter and a receiver of radiation, the passage of a signal through such a medium is radically different than when the medium is at rest. A study will be made of the basic physics describing the propagation of radiation through inhomogeneous moving media, as it pertains to the earth's ionosphere and magnetosphere. This will permit an improved understanding of transmission, reflection, and distortion of signals in such media, and will provide input parameters required for an improved, magnetospheric model relating the quality of communications to geomagnetic activity.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory PH, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0008, RADIATIVE TRANSFER IN THE ATMOSPHERES OF THE EARTH AND PLANETS

W.M. IRVINE, Univ. of Massachusetts, School of Arts & Sciences, *Amherst, Massachusetts* 01002 (INT76-00643)

Scientists at the University of Massachusetts and the Kanazawa Institute of Technology are cooperating on a study of radiative transfer in atmospheres of earth and other planets. In an effort to define optimum techniques for the determination of atmospheric properties, numerical and analytical aspects of radiative transfer in realistic planetary atmospheres are being studied. In the case of earth, this study is relevant to weather prediction and the distribution of atmospheric pollutants. In the case of other planets, it is relevant to the interpretation of ground-based and spacecraft observations and the design of future spacecraft observations for the determination of atmospheric thermodynamic properties, aerosol size and composition, and horizontal and vertical atmospheric structures.

SUPPORTED BY U.S. Natl. Science Foundation

10.0009, SOLAR RADIATIVE PROCESSES

R.C. ALTROCK, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244590)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate warnings of sun-induced disruptions. Objective - determine the effect of solar structures, motions and magnetic fields on the quiet atmosphere and how each contributes to the environment for solar activity - define a numerical reference model for the quiet, steady-state solar atmosphere, a necessary starting point for many other work units - devise practical theoretical tools for dealing with many radiative transfer problems that arise in other work units and test those tools - determine the mechanical energy flux of such processes as convection and oscillations at different levels and horizontal positions in the solar atmosphere and the contribution of this flux to the heating of the upper layers. How research contributes - provides the physical knowledge necessary for a sound cause-and-effect prediction technique for solar-induced disruptions.

A generalized Newton-Raphson code for simultaneous solution of the transfer and equilibrium equations in both lines and continua will be developed. The hydrogen-ionization code for hydrostatic atmospheres will be improved to include simultaneous solution of both the ionization and excitation problems. The above techniques will be tested on the OSO-I line profile observations. The coelostat and high-resolution photoelectric double-pass spectrograph will be used to record the absolute intensity of the spectrum of the average solar radiation in the visible wavelength region. Codes will be used to construct model atmospheres, to find the heights of formation of absorption lines observed at SPO and predict the observable consequences of changes in the physical conditions. In addition, the mechanical forces will be taken into account to derive their effect on the atmospheric models and interpret observations made at SPO. To further study the mechanical energy flux we will analyze observations of granulation, supergranulation and oscillating elements taken with the diode array of the tower telescope.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory LM, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0010, ROCKET MEASUREMENTS OF SOLAR UV
D.E. BEDO, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF254650)

AF function - vehicle tracking during flight and reentry, trajectory prediction, communication systems. Deficiency - insufficient data to allow accurate modelling of the average composition and structure of the upper atmosphere and of the ionosphere and to predict properly the response of the atmosphere and ionosphere to temporal variations in the solar input. Objective - the precise measurement of the incident solar intensity throughout the spectral range 50 to 3000 angstroms under differing levels of solar activity and the derivation, from observations of atmospheric absorption at wavelengths within this spectral range, of the composition of the atmosphere above 100 kilometers. How research contributes - provides direct measurement of the major source of energy which is input to the upper atmosphere and the manner of deposition of this energy as a function of altitude - explicit considerations in models of atmospheric heating, photochemical equilibrium and charged particle production.

Solar intensity data are acquired from rocket-borne instrumentation. For the short wavelength region, 50 to 1250 angstroms, scanning spectrometers of the grazing incidence type are used, while at longer wavelengths, 1250 to 3500 angstroms, the spectrometers are of the normal-incidence, Ebert type. Intensity data are obtained at rocket altitudes above 100 km on both the up-leg and down-leg portions of the trajectory. At apogee, the measurement is essentially the unattenuated flux, requiring only a minor correction for the remaining atmospheric absorption. For wavelengths shorter than 1000 angstroms, appreciable absorption is observed at the lower altitudes permitting a determination of the optical depth as a function of altitude. From model considerations and measured optical depths, the number density of the atmospheric components can be inferred. Prior to launch, flight instrumentation is calibrated at AFCRL using laboratory monochromators and photometric standards.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory LK, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0011, DYNAMICAL PROPERTIES OF THE MAGNETOSPHERE
R.O. HUTCHINSON, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF257180)

AF function - operation of systems for communications, detection, surveillance, guidance, and navigation. Deficiency - performance degrades and becomes unpredictable during severe magnetic activity. False signals may occur. Objective - to construct in FY75 a network of 5 field stations for the collection of terrestrial magnetic activity data to be used for the development of models of the complex earth- ionosphere, magnetosphere-solar wind system and from which magnetic activity levels may be specified in real time. How research contributes - the ability to predict magnetic activity 1-3 hours in advance would enable the Command Director of NORAD to anticipate critical periods for these systems and exercise his options for alternate methods of surveillance. A capability to predict magnetic activity would minimize SAC missions that are aborted because of communication problems because mission planners could reschedule missions for quiet magnetic periods or modify the communications plan, i.e., change the mode of transmission from HF to line of sight.

Models of the complex earth-ionosphere, magnetosphere-solar wind system are required in order to specify and predict magnetic activity levels. Construction and verification of these models require a broad data base and the requirements for specifications and prediction make real-time data collection necessary. Five data collection platforms for sensing component magnetic activity will be installed along a line of constant magnetic latitude. The digital data from each site will be transmitted via full duplex phone lines to a computer-controlled data acquisition station at AFCRL. This system will be completed in FY 75 and will be operated to test all hardware, verify software now in preparation and to de-bug and systematize the data collection and handling procedures. The development of models describing magnetic activity will be concentrated in three particular areas - a study of the solar wind and its interaction with the magnetosphere and as a triggering mechanism for storm activities, and investigation of substorms, their growth, expansion and recovery phases and the formulation of a micropulsation substorm model whose phenomenological parameters will be used to specify a substorm and ultimately will be employed to predict magnetic activity. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0012, INTERPRETATION OF SILICON AND CARBON LINE SPECTRA IN EARLY-TYPE STARS
K.W. KAMP, Boston University, Graduate School, *Boston, Massachusetts* 02215 (AST75-17846)

The O- and B-type stars are important for the study of stellar evolution, the interstellar medium and galactic structure and evolution. Major theoretical advances have been made recently in treating non- equilibrium effects and line-blanketing. The proposed research will continue previous work utilizing these advances in the computation of spectral lines. These computations use realistic models of the atmosphere of O- and B-stars, and sophisticated energy level models of the atoms of silicon and carbon. Observations of these lines will then yield temperature, gravity and abundances for a given star. The observational data will be ultraviolet spectra acquired by the Copernicus satellite.

SUPPORTED BY U.S. Natl. Science Foundation

10.0013, SOLAR RADIO BURST AND PATROL DATA STUDIES APPLIED TO SPACE ENVIRONMENT
P.M. BAKSHI, Boston College, School of Arts & Sciences, *Chestnut Hill, Massachusetts* 02167 (DF277710; F19628-76-C-0008)

AF function - communications and surveillance. Deficiency - lack of understanding of solar radio burst processes and insufficient correlation studies impede progress in solar particle spectrum and intensity prediction. Objective - to confirm and test new theoretical models with observational data. In particular the U-shaped spectrum which is an observational reality is tested as a single mechanism rather than a composite of two mechanisms with a crossover. To establish correlation between radio and proton data so that radio may henceforth be used as a predictor. How research contributes - radio spectral information becomes available minutes or hours before the first onset of particles. Hence radio data has a prediction capability once correlations are established.

The validity of the U-shaped radio spectrum and the parameter within the 'U' are explored. In particular, proton energy levels are to be sought from established empirical relationships between the burst spectral U broadness and the proton energy distribution. Ultimately the delay to the first onset of protons and the duration of the proton event will be addressed.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory PH, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0014, MAGNETOHYDRODYNAMICS RESEARCH
J.H. THOMAS, Univ. of Rochester, School of Engin. & Appl. Sci., *Rochester, New York* 14627 (DF243120; F19628-75-C-0011)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate solar disturbance predictions. Research - perform studies on the structure and dynamics of solar penumbral regions. Approach - the approach is the application of theoretical magnetohydrodynamics to explain the observed motions in and configuration of sunspot penumbrae. This work will provide a greater insight toward understanding the physics of punumbrae and their impact on the adjacent solar flare-producing plage regions.

ADDENDA: Supporting Agency Address is: AF Geophysics Laboratory PH, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0015, PARALLAX PROGRAM AT THE ALLEGHENY OBSERVATORY
G.D. GATEWOOD, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (AST75-02641 A01)

Precision measurement of the parallactic shift for the nearby stars as the earth circles about the sun furnishes the important result of the star's distance and hence its true brightness. Continuation of such measures also reveals the star's motion through space. In addition for binary stars the stellar masses are determined in favorable cases. These parameters are important results for the physics of the stars.

The Pittsburgh group will continue parallax observations for stars of general interest, brighter than magnitude 16 and north of -20 degrees declination, thought to be within 65 light years of the sun, also some stars of greater distance but of special interest, including those of the Hyades cluster, in an international campaign. In addition, a number of visual and astrometric binaries will be continued under long-term observation. The many requests expected from other astronomers will be processed as rapidly as possible. Further study of ways of improving the precision of observation and reduction will be emphasized.

Prior support was by NSF grant AST 75-02641.

SUPPORTED BY U.S. Natl. Science Foundation

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Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

No abstracts in this category.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N77-12995 Ohio State Univ., Columbus.
ASYMPTOTIC SOLUTION FOR TWO-DIMENSIONAL VISCOUS SUPERSONIC AND HYPERSONIC FLOWS PAST COMPRESSION AND EXPANSION CORNERS
Donald Pasquale Rizzetta 1976 240 p
Avail: Univ. Microfilms Order No. 76-24675

In the limit as Reynolds number tends to infinity, the correct mathematical structure of inviscid-viscous supersonic and hypersonic interacting flows is described by the Stewart-son-Williams triple-deck formulation. The triple-deck equations are generalized for unsteady flows and the corresponding asymptotic form of the energy equation is deduced. For small ramp angles, an analytic solution of the energy equation is derived. A numerical technique for solving the unsteady triple-deck equations for ramp flows is formulated, and steady state solution of both separating and non-separating cases are obtained. The method incorporates a partially time-implicit scheme for solving an unsteady shear transport equation, where the geometry of the problem is simplified by use of Prandtl's transposition theorem. Application of upstream and downstream asymptotic boundary conditions greatly reduces the extent of the computational mesh.
Dissert. Abstr.

N77-12996 Stanford Univ., Calif.
AERODYNAMIC LOADS NEAR CRANKS, APEXES, AND TIPS OF THIN, LIFTING WINGS IN SUBCRITICAL FLOW
Richard T. Medan 1976 115 p
Avail: Univ. Microfilms Order No. 76-26040

The calculation of the subcritical, linearized, and irrotational flow in the vicinity of tips and corners of thin, lifting wings is considered. The important characteristics of the flow are governed by an eigenvalue problem, which is nonlinear at the trailing edge because of the shed wake (which is assumed to be in the wing plane). A method was devised because the existing methods were either not valid for the trailing edge case or would have required excessive amounts of computer time. The new method, which is fundamentally different from the previous ones, was used to calculate solutions for a number of cases, including cases for which correct answers had not previously been obtained. Two of these solutions were used to determine the validity of leading edge suction distributions near the tips of a delta wing and a swept wing as calculated using both the vortex lattice method and a kernel function method. One of the latter methods appeared to be giving incorrect results. Dissert. Abstr.

N77-12997 Princeton Univ., N.J.
AN EXPERIMENTAL STUDY OF INSTABILITY AND TRANSITION IN AN AXISYMMETRIC WAKE Ph.D. Thesis
Leigh Francis Peterson 1975 235 p
Avail: Univ. Microfilms Order No. 76-23809

The growth of small disturbances in the incompressible axisymmetric wake of a slender body of revolution has been studied experimentally. The experiments were performed in a running water channel at a Reynolds number of 3,600 based on the body diameter and free stream velocity, without any artificial stimulation of the wake. Digital data analysis has been used to compute energy spectra, coherences and phase differences from the output signals of a multichannel hot-film anemometer system. The mean velocity profile at the trailing tip of the body was considerably thicker than the Blasius profile for a flat plate at the same Reynolds number based on distance from the origin of the boundary layer. The mean velocity profiles quickly become self-similar in the wake, but the profile observed is not that predicted by the asymptotic similarity solution. Dissert. Abstr.

N77-12998 Stevens Inst. of Tech., Hoboken, N.J.
THIN AIRFOIL IN EDDY-ARRAY AND PART-STALLED OSCILLATING CASCADE Ph.D. Thesis
Periyammal V. K. Perumal 1975 183 p
Avail: Univ. Microfilms Order No. 76-25167

A translating plane rectangular grid of eddy-array is represented by a suitable streamfunction. The unsteady response of a flat plate airfoil to such large nonpotential flow disturbance is evaluated. The method of analysis adopted is the singularity distribution principle in combination with the time-marching technique. The problem is solved in two stages, namely, (1) auxiliary solution and (2) time-marching solution. The analysis is extended to evaluate the perturbed aerodynamic response of a harmonically oscillating flat plate cascade at part-stalled flow conditions. Conformal mapping, the concept of acceleration potential and discretization scheme are essential features of the analysis. Dissert. Abstr.

N77-12999*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WIND-TUNNEL INVESTIGATION OF A LARGE-SCALE MODEL OF A LIFT-CRUISE FAN V/STOL AIRCRAFT WITH EXTENDED LIFT-CRUISE NACELLES
Bruno J. Gambucci, Kiyoshi Aoyagi, and Stewart L. Rolls Aug. 1976 95 p refs
(NASA-TM-X-73164; A-6727) Avail: NTIS MF A01/MF A05 CSCL 01A

The aerodynamic characteristics of a large-scale model of a lift/cruise fan V/STOL aircraft were determined. The model was equipped with three fans, one mounted in the forward section of the fuselage in a lift mode, and two mounted on top of the wing adjacent to the fuselage in a lift/cruise mode. The data

that were obtained include longitudinal and lateral-directional characteristics of the model, with the horizontal tail on and off, for both the powered-lift and cruise configurations. Lateral-directional characteristics were obtained with the horizontal and vertical tail sections removed. Powered-lift data were obtained at several wind-tunnel velocities and at several lift-cruise fan thrust vector angles by varying the position of the hooded deflectors from 0 deg (the cruise condition) to 90 deg. Author

N77-13000*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA AMES POTENTIAL FLOW ANALYSIS (POTFAN) GEOMETRY PROGRAM (POTGEM), VERSION 1
R. T. Medan and R. B. Bullock Aug. 1976 208 p ref Prepared in conjunction with Computer Sciences Corp., Mountain View, Calif.
(NASA-TM-X-73127; A-6558) Avail: NTIS MF A01/HC A10 CSCL 01A

A computer program known as POTGEM is reported which has been developed as an independent segment of a three-dimensional linearized, potential flow analysis system and which is used to generate a panel point description of arbitrary, three-dimensional bodies from convenient engineering descriptions consisting of equations and/or tables. Due to the independent, modular nature of the program, it may be used to generate corner points for other computer programs. Author

N77-13001*# Boeing Commercial Airplane Co., Seattle, Wash.
COMPARISONS OF SEVERAL AERODYNAMIC METHODS FOR APPLICATION TO DYNAMIC LOADS ANALYSES Final Report
Richard I. Kroll and Ronald D. Miller Jul. 1976 127 p refs (Contract NAS2-7729)
(NASA-CR-137720; D6-44111) Avail: NTIS HC A07/MF A01 CSCL 01A

The results of a study are presented in which the applicability at subsonic speeds of several aerodynamic methods for predicting dynamic gust loads on aircraft, including active control systems, was examined and compared. These aerodynamic methods varied from steady state to an advanced unsteady aerodynamic formulation. Brief descriptions of the structural and aerodynamic representations and of the motion and load equations are presented. Comparisons of numerical results achieved using the various aerodynamic methods are shown in detail. From these results, aerodynamic representations for dynamic gust analyses are identified. It was concluded that several aerodynamic methods are satisfactory for dynamic gust analyses of configurations having either controls fixed or active control systems that primarily affect the low frequency rigid body aircraft response. Author

N77-13002*# Computer Sciences Corp., Mountain View, Calif. Applied Technology Div.
FLEXSTAB ON THE IBM 360
R. S. Pyle, R. G. Sykora, and S. C. Denman Jul. 1976 55 p refs
(Contract NAS2-6912)
(NASA-CR-137900) Avail: NTIS MF A01/HC A04 CSCL 01A

FLEXSTAB, an array of computer programs developed on CDC equipment, has been converted to operate on the IBM 360 computation system. Instructions for installing, validating, and operating FLEXSTAB on the IBM 360 are included. Hardware requirements are itemized and supplemental materials describe JCL sequences, the CDC to IBM conversion, the input output subprograms, and the interprogram data flow. Author

N77-13003# Akron Univ., Ohio.
DYNAMIC RESPONSE OF NONUNIFORM ROTOR BLADES
Demeter G. Fertis 28 Jul. 1975 25 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Aircraft in May 1977
Avail: NTIS HC A02/MF A01

Theoretical investigations related to the theory of rotating blades, such as helicopter blades are presented. The plane of rotation of the blade was not perpendicular to the axis about which the blade rotates. Discontinuities along the elastic axis, as well as supporting shaft flexibility, were also taken into consideration. The general differential equations of rotating pretwisted blades under arbitrary loading and the tedious general expressions for the quantities involved in these equations were derived. The aerodynamic loadings are left in general form. This theory can be used to solve problems where these effects are significant and also to evaluate the easily applicable less complete theories that are used in practice. If the aerodynamic loadings are taken as zero, then the case of the free vibration of the blade is obtained. Author

N77-13004# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
CALCULATIONS ON AIRFOIL-FUSELAGE COMBINATIONS IN TRANSONIC FLOW. PROBLEMS RESULTING FROM THE APPLICATION OF THE FINITE ELEMENT METHOD [CALCUL D'ENSEMBLE VOILURE-FUSELAGE EN REGIME TRANSSONIQUE. PROBLEMES POSES PAR LA MISE EN EXPLOITATION DES METHODES D'ELEMENTS FINIS]
J. Naves Paris Assoc. Aeron. et Astronautique de France 1975 39 p refs In FRENCH Presented at the 12th Ecole Natl. Super de Mecan. et d'Aerotech./CEAT Colloq. d'Aerodyn. Appl., Poitiers, France, 5-7 Nov. 1975
(AAAF-NT-76-1; DGT-11.850; ISBN-2-7170-0379-7) Avail: NTIS HC A03/MF A01; CEDOCAR, Paris FF 25 (France and EEC) FF 29 (others)

The difficulties encountered in applying the finite element method to calculations on aircraft models in three-dimensional compressible transonic flow are presented. Three-dimensional compressible flow calculation methods are recalled and compared: integral, finite difference, and finite element methods. Problems related to the finite element method, such as general problem of gridding and choice of the logical description of the grid, are presented and global schematic examples are discussed. It is concluded that the development of the finite element method necessitates beginning with the resolution of a sophisticated spatial grid around complex aerodynamic bodies. ESA

N77-13005# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
DESIGN AND TEST OF A WIND TUNNEL MODEL PT2, A SONIC ROOF-TOP WING ON A SIMPLE BODY Final Report
Anders L. Gustavsson 1976 45 p refs
(Contract FMV-F-INK-07-12615)
(FFA-TN-AU-928) Avail: NTIS HC A03/MF A01

One of the possible transonic design principles for an airplane with a wing of moderate aspect ratio is to design the wing with straight isobars all over the span and a pressure plateau with local normal Mach number equal to one in the design point. Such a sonic roof-top wing was designed, built, and tested. The wing is mounted on a cylindrical body; both balance tests and pressure measurements were carried out. An alternative area ruled body was also designed and tested. The test results show that even though the target drag rise Mach number was not fully reached the PT2-model gives a drag rise Mach number as good as or better than a reference model PT1 in the same model series. The PT2 results, however, were obtained with a much thicker wing root, which is very valuable for structural reasons. Comparisons between measured and calculated pressure distributions are also included. The agreement between the experimental and theoretical results produced by the panel method, used at the time of design for the PT2 model, is not very satisfactory. Comparisons with theoretical results obtained with the latest improved version of the panel method and with the transonic small perturbation finite difference method show good agreement for subcritical and supercritical flow conditions, respectively. Author (ESA)

N77-13006# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
TRANSONIC WIND TUNNEL TESTS OF THE PT3 MODEL, A SUPERCRITICAL WING ON A SIMPLE BODY. PART 2: TEST RESULTS AND ANALYSIS Final Report
Roine Mattsson and Anders L. Gustavsson 1976 66 p refs
(Contract FMV-F-INK-82223-73-009-07-001)
(FFA-TN-AU-1134-Pt-2) Avail: NTIS HC A04/MF A01

A supercritical airfoil was applied in a design of a wind tunnel model with a moderate aspect ratio wing. The detailed

results from wind tunnel tests are presented in tables, diagrams, and oil flow pictures including the effect of different transition trip positions as well as the effect of yaw angle. Author (ESA)

N77-13007# Bristol Univ. (England). Dept. of Aeronautical Engineering.

EFFECTS OF WIND TUNNEL FLOW CONDITIONS ON THE FLOW ROUND CIRCULAR CYLINDERS B.S. Thesis

S. P. Ayres and C. J. Trigg Jun. 1976 46 p refs
(BU-205) Avail: NTIS HC A03/MF A01

Investigations into stagnation pressure coefficients and surface static pressure profiles for a transversely mounted cylinder in the upper test section of the 28 in wind tunnel have over several years produced very unexpected results. A thorough investigation into the static and dynamic pressure distributions within the working section showed a velocity variation over the central 70% of the flow of + or - 1.0% at the exit of the contraction, and + or - 0.7% midway down the working section. Although the least uniform distribution was found near the exit of the contraction, no separation, vortex shedding, or swirl could be detected. Attempts to monitor flow conditions, upstream of the cylinder, with a pitot-static tube, resulted in a complex interaction between the cylinder and the pitot-static tube, causing a large modification of the static pressure distribution over the surface of the cylinder. The selection of a new tunnel reference pressure tapping, and its calibration to the static and dynamic pressures as the testing positions in the working section, yielded much improved static pressure coefficient profiles around the cylinder, and values of the stagnation pressure coefficient of unity, within experimental error. Author (ESA)

N77-13008# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

EFFECT OF UNSTEADY VARIATIONS IN HORIZONTAL FLOW VELOCITY ON THE UNSTEADY AERODYNAMIC FORCES ON A PRELOADED LIFTING SURFACE [EINFLUSS INSTATIONAERER AENDERUNGEN DER HORIZONTALEN ANSTROEMGESCHWINDIGKEIT AUF DIE INSTATIONAEREN LUFTKRAEFTE AN EINER VORBELASTETEN AUFTRIEBSFLAECHE]

D. Herberg and W. Schuler Bonn DOKZENTBw 1975 72 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-75-28) Avail: NTIS HC A04/MF A01; DOKZENTBw DM 50

Analytical investigations were carried out for the special practical problems of the fixed wing and the rotary wing. Two corresponding mathematical methods were developed in the two-dimensional incompressible case considering the unsteady variation of horizontal velocity induced by vortex sheets. Numerical calculations for selected examples were made after programming the theory in FORTRAN language. The parameters introduced in the problem (angle of attack, distance between two lifting surfaces or vortex sheets, frequency of oscillation) were varied systematically with respect to various airfoil oscillations. Results indicate that the influence of the additional horizontal velocity on unsteady aerodynamic forces is different in the particular examples and that the resulting additional parts of lift and moment must be considered in certain combinations of parameters. Author (ESA)

N77-13009# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

THE COMPUTATION OF NON-POTENTIAL TRANSONIC FLOWS BY RELAXATION METHODS

G. M. Johnson and H. J. Wirz Bonn DOKZENTBw 1976 67 p refs Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-76-2) Avail: NTIS HC A04/MF A01; DOKZENTBw DM 30

A method for the computation of non-potential two-dimensional steady supercritical flows is presented. The application of the method to certain internal and external flow problems is discussed. The results of a simple test of the method in a strictly supersonic divergent nozzle are presented. The concept of a surrogate partial differential system is introduced. Its utility is illustrated for the case of the steady Euler system. Author (ESA)

N77-13010# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.

DETACHMENT AND WIND RECIRCULATION OF RADIAL WALL JETS Ph.D. Thesis [ABLOESUNG UND WINDRUECKFUEHRUNG RADIALER WANDSTRAHLEN]

Siegfried Harmsen 1976 75 p refs In GERMAN
(ILR-9; ISBN-3-7983-0552-8) Avail: NTIS HC A04/MF A01

The problem of reingestion of VTOL hot exhaust gases, and thus thrust reduction, as a result of recirculation by wind or heat lift is dealt with. The lift jets propagate on the ground, after deflection, as radial wall jets. The detachment radius of these jets is determined by applying similarity theorem to known model test results. The propagation properties, the detachment line, and the recirculation phenomena of a radial wall jet subjected to wind were determined experimentally. The detachment radius was calculated as a function of the velocity ratio and the jet propagation angle. The form of recirculation can be approximated by a two-dimensional potential theory model. It is shown for a four-jet model arrangement that an additional jet can to a large extent supress the various recirculation phenomena. ESA

N77-13011# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

EVALUATION OF A COMPUTERIZED METHOD FOR DESCRIPTION OF THE SUBSONIC, VISCOUS, ATTACHED FLOW ABOUT TWO-DIMENSIONAL, MULTI-COMPONENT AIRFOILS Final Report

Erling Weibust 1976 103 p refs
(Contract F-INK-82223-072-004-07-001)
(FFA-TN-AU-999) Avail: NTIS HC A06/MF A01

A method, previously developed, for computation of the viscous flow about two-dimensional multi-component airfoils was evaluated. The computer program is based on a mathematical model for approximate calculation of subsonic, viscous attached flow on two-dimensional airfoils. The airfoils may consist of up to four elements arbitrarily arranged. The viscous flow is approximated by an external potential flow outside the boundary layer displacement thickness, and by boundary layer flows along the contours of the airfoil elements. Mixing of a wake from a forward component with the boundary layer is considered, and laminar flow bubbles can be handled, but not large separated regions. Pressure distributions and boundary layer properties were calculated and compared with earlier results, both theoretical and experimental. Results for single element airfoils appear very reliable, but some of the multiple component airfoils data could be improved. It is believed that both the model for wake boundary layer mixing and the model for addition of the boundary layer into the equivalent airfoil need further development. The program has been tested for estimation of maximum lift coefficient and stall angle for single element airfoils. It is concluded that, as the program is developed for attached flow, it can only reliably predict the maximum lift coefficient if the separation occurs abruptly. Author (ESA)

N77-13012# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.

COMPARATIVE WIND TUNNEL INVESTIGATION OF SAIL PROFILES FOR WINDMILLS [VERGELIJKEND WINDTUNNELONDERZOEK VAN PROFIELEN VAN FOKWIEKEN VOOR WINDMOLENS]

P. L. Fauel Feb. 1975 20 p In DUTCH
(VTH-191) Avail: NTIS HC A02/MF A01

Low speed wind tunnel tests were carried out to determine sail profiles for improving the performance of classical Dutch windmills. Results are presented in graphs, in which the coefficient of force-in-plane related to the wind velocity is depicted as function of the ratio between circumferential speed and effective wind velocity. It appears that improvements in performance may be obtained by changing the shape of the sails. ESA

N77-13013# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

THREE-DIMENSIONAL EFFECTS IN SONIC BOOM THEORY

T. P. M. Hendriks Sep. 1975 41 p refs
(VTH-196) Avail: NTIS HC A03/MF A01

Examining the validity and applicability in sonic boom calculations of (a) the Whitham-Walkden theory and (b) the first order approximation of a perturbation theory, based on the method of characteristics, it was found by Oswatitsch and Sun that the

two methods yield different pressure signatures in the far field of a supersonic delta wing. The reason for the differences is discussed; by means of a simple procedure the reliability of both theories is compared in case they give different results. From these considerations it becomes evident that in the near field of planar systems the method under (b) should be used, that in the midfield a second order approximation is sometimes necessary, and that in the far field the Whitham-Walkden method is reliable and simple. Author (ESA)

N77-13014# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

HIGH SUBSONIC AND TRANSONIC EFFECTS IN UNSTEADY AERODYNAMICS

H. Tijdeman May 1975 65 p refs

(NLR-TR-75079-U) Avail: NTIS HC A04/MF A01

Based on experimental results for a two-dimensional airfoil (NACA 64A006) with a sinusoidally-oscillating trailing-edge flap an illustration is given of typical effects occurring in high subsonic and transonic flow around oscillating airfoils and wings. It is shown that in this speed regime the unsteady airloads are influenced considerably by the interaction of the steady and unsteady flow fields. Moreover the periodical motion of the shock waves - if present - introduces relatively high local loads, which may contribute significantly to the overall unsteady forces and moments. In addition a review is given of available theoretical methods and it is tried to rate the practical value of some of the most advanced methods, which take into account both the effect of thickness and the effect of the oscillating shock waves. Author (ESA)

N77-13015# European Space Agency, Paris (France).

UNSTEADY AERODYNAMICS OF HELICOPTER BLADES

Rolland Dat Oct. 1976 14 p refs Transl. into ENGLISH of 'Aerodyn. Instationnaire des Pales d'Helicoptere', ONERA, Paris Report ONERA-TP-1975-121, 1975 Original report in FRENCH previously announced as N76-24149

(ESA-TT-327; ONERA-TP-1975-121) Avail: NTIS HC A02/MF A01

A method that predicts the unsteady periodic aerodynamic forces on helicopter blades in forward flight is described. The blade sections are assimilated to airfoils; the lift at high angle of attack is given by a mathematical model and the three-dimensional interferences between blades and between separate sections of the same blades are given by the linearized lifting surface theory. The comparison between theoretical and experimental results is satisfactory. The range of applications of the method used to synthesize the three-dimensional theory and the experiments in two-dimensional flow is not restricted to helicopters. Author (ESA)

N77-13016# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Angewandte Gasdynamik.

AERODYNAMIC COEFFICIENTS OF THE FIRST REENTRY-STAGE OF THE REUSABLE BALLISTIC ROCKET NEPTUN IN SUPERSONIC FLOW EMPLOYING THE AIR BRAKES AS CONTROL SURFACES

Hans Emunds and Hansgeorg Riedel 14 Apr. 1976 270 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-344)

(DLR-FB-76-13) Avail: NTIS HC A12/MF A01; DFVLR, Cologne, DM 95,90

The aerodynamic coefficients were experimentally determined in a 30 x 30 sq cm supersonic wind tunnel for ranges of Mach number between 2.25 and 4.15 and angles of incidence -3 and 5 deg. Main attention was fixed on the gliding flight properties which are of importance for recovery and which were compared with those of a typical lifting reentry body (ERNO LB1). Results show that with reference to the maximum attainable range the lifting body possesses a gliding flight behavior better by an order of magnitude than that of the ballistic reentry body. Typical values of the lift-drag ratio are 0.1 for Neptun W1 and 1.5 for ERNO LB1. In contrast the static longitudinal stability of the ballistic flight vehicle is superior to that of the lifting body. The latter can only be maintained on a descending glide path in a trimmed flight state with the aid of aerodynamic control surfaces. Author (ESA)

N77-13017# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Angewandte Mathematik und Mechanik.

EXPERIMENTAL INVESTIGATION OF LONGITUDINAL VORTICES IN THE FORWARD STAGNATION POINT REGION OF A CIRCULAR CONE IN AN AXISYMMETRIC FLOW

Heinrich Hassler 8 Jun. 1976 50 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-345)

(DLR-FB-76-31) Avail: NTIS HC A03/MF A01; DFVLR, Cologne, DM 19,80

In the forward stagnation point region of a circular cone the occurrence of Taylor-Goertler-vortices has been observed even in a flow of low turbulence. This instability bears a similarity to the system of counter-rotating vortices occurring along a concave wall. Visual observations and hot wire measurements show that this instability has its origin in the stagnation region. Secondary instability appears downstream in the radial zones of lower velocity. The velocity distributions in both regions of instability were investigated and compared with former experimental and theoretical results. Author (ESA)

N77-13018# Lockheed Missiles and Space Co., Huntsville, Ala.

WAKE VORTEX AND GROUNDWIND METEOROLOGICAL MEASUREMENTS Final Report, 28 Aug. 1974 - 5 Sep. 1975

M. R. Brashears, K. R. Shrider, D. A. Love, S. J. Robertson, and A. D. Zalay May 1976 174 p refs

(Contract DOT-TSC-904)

(AD-A029164/1; LMSC-HREC-TR-D496558; FAA-RD-76-93; DOT-TSC-FAA-76-14) Avail: NTIS HC $6.75/MF A01 CSCL 01/3

Wake vortex groundwind and meteorological measurements obtained at John F. Kennedy (JFK) International Airport were reduced, analyzed, and correlated with a theoretical vortex transport model. The predictive Wake Vortex Transport Model was updated so that detailed on-site meteorological measurements can be interpreted and utilized to predict more accurately the vortex transport and decay characteristics. A discussion of the wake vortex test data analysis and software development is presented, including a description of the JFK wake vortex test program, the computer processing of wake vortex measurements, the analysis of groundwind sensor measurements, and the analysis of meteorological measurements. Author

N77-13019# Advanced Technology Labs., Inc., Westbury, N.Y.

AN ANALYSIS OF TRANSONIC JET-FLAPPED AIRFOILS WITH THE INCLUSION OF VISCOUS EFFECTS Final Report, 1 Oct. 1973 - 20 Sep. 1975

S. Elzweig, P. Baronti, and G. Miller May 1976 52 p refs

(Contract F44620-74-C-0014; AF Proj. 9781)

(AD-A027712; ATL-TR-230; AFOSR-76-0840TR) Avail: NTIS HC A04/MF A01 CSCL 01/1

The inviscid and viscous effects associated with a jet-flapped airfoil in the transonic regime are investigated. Integral methods are used for the description of the viscous portions of the flow, and a relaxation method is used for the inviscid portions. The viscous-inviscid coupling is delineated. Their coupling procedures along the wing and the jet acknowledge the importance and magnitude of the viscous effects on pressure distribution and directly incorporate the displacement effect on the wing and the effects of jet mixing into the boundary conditions for the computation of the entire flow. Preliminary numerical results are presented to validate the solution. A computer program for a systematic exploitation of the complete analysis is discussed GRA

N77-13020# General Dynamics/Convair, San Diego, Calif.

NONLINEAR LIFTING LINE THEORY FOR PREDICTING STALLING INSTABILITIES ON WINGS OF MODERATE ASPECT RATIO Final Technical Report, 30 Jun. 1975 - 15 Jun. 1976

Stanley T. Piszkin and E. S. Levinsky 15 Jun. 1976 94 p refs

(Contract N62269-75-C-0356)

(AD-A027645; CASD-NSC-76-001) Avail: NTIS HC A05/MF A01 CSCL 01/1

A computational procedure has been developed for predicting the time dependent longitudinal and lateral aerodynamic characteristics of wing-body configurations at angles of attack up to and beyond stall. The purpose of the procedure is to provide the aircraft designer with a tool for simulating and alleviating such adverse wing stalling characteristics as wing rock, wing drop, loss of roll control or roll control reversal, etc. and thereby lead to the design of aircraft with improved stall, departure and spin resistance characteristics. The procedure is based on nonlinear lifting line theory which has been modified to include unsteady wake effects. GRA

N77-13021# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
INVESTIGATION OF SMALL SURFACE PROTUBERANCES UP-STREAM OF TURBULENT BOUNDARY LAYER SEPARATION PRODUCED BY A SKEWED SHOCK AT MACH 3 Interim Report, Jan. - Feb. 1976
Robert H. Korkegi May 1976 19 p refs
(AF Proj. 7065)
(AD-A026526; AFAPL-TR-76-16) Avail: NTIS HC A02/MF A01 CSCL 20/4

Tests were undertaken to determine the effect, if any, of a row of small sub-boundary layer-sized cylinders on a region of three-dimensional turbulent boundary layer separation produced by a skewed shock wave at a Mach number of 3. Surface oil flows and pressures showed no influence of the row of cylinders on the region of separation. Author (GRA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N77-13022 Princeton Univ., N.J.
STATISTICAL METHODS FOR THE ESTIMATION OF AIRCRAFT COLLISION RISK Ph.D. Thesis
Alan Robert Kerstein 1976 143 p
Avail: Univ. Microfilms Order No. 76-25111

The estimation of aircraft collision risk for a parallel track air traffic system is formulated in terms of the lateral overlap integral, a function of the distribution of lateral deviations from course. Several statistical methods are developed or modified for the purpose of estimating the lateral overlap integral based on a random sample from the lateral deviation distribution. Both nonparametric and parametric methods are proposed, and their statistical properties are evaluated through data analysis as well as theoretical examination. Results of particular interest are new inequalities in the theory of distributions, used to obtain bounds on the collision risk, and novel approximate methods for variance estimation. Dissert. Abstr.

N77-13023# Federal Aviation Administration, Washington, D.C.
A CRASHWORTHINESS ANALYSIS WITH EMPHASIS ON THE FIRE HAZARD: US AND SELECTED FOREIGN TURBINE AIRCRAFT ACCIDENTS 1964-1974 Final Report
Thomas G. Horeff Jul. 1976 166 p refs
(AD-A029162/5; FAA-RD-75-156) Avail: NTIS HC A08/MF A01 CSCL 01/3

An analysis of 382 impact survivable/substantial damage turbine aircraft accidents and incidents which occurred during the 11-year period from 1964 through 1974 was performed as part of an overall study of the interrelationship of aircraft crashworthiness and airport crash fire rescue services. The crashworthiness analysis indicated that 94.9 percent of the fatalities in world wide U.S. aircarrier impact survivable accidents resulted from accidents where fire occurred. Fire and its effects were estimated to be the cause of: (1) forty percent of the fatalities; (2) fatal injuries to 23.3 percent of the occupants in suvivable/fatal accidents; and (3) a reduction in survivability, from 65.2 percent to 41.9 percent, of the occupants in survivable/fatal accidents. The status of FAA crashworthiness R and D programs directed toward the development of aircraft fire protective measures is described to focus on efforts being taken to reduce the fire hazard. Author

N77-13024# Civil Aeromedical Inst., Oklahoma City, Okla.
ACCIDENT EXPERIENCE OF CIVILIAN PILOTS WITH STATIC PHYSICAL DEFECTS
J. Robert Dille and Charles F. Booze Jun. 1976 7 p refs
(AD-A029431/4; FAA-AM-76-7) Avail: NTIS HC A02/MF A01 CSCL 01/2

The FAA experience with the civilian pilots who have static physical defects was examined and accident rates were calculated for several categories of pathology for comparison with the overall accident rates in general aviation activities. Three categories exceeded expectations significantly: blindness or absence of one eye, deficient color vision with a waiver, and deficient distant vision. However, these groups reported much higher median flight times than a non-accident airman population and accident airmen without any of the pathology selected for this study. Analyses of available data proved inconclusive but increased exposure may account for most or all of the increased accidents observed for airmen with these three pathologies. None of the accidents was related to the pilots' physical condition in the reports. Author

N77-13025# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
NONFATAL, WEATHER-INVOLVED GENERAL AVIATION ACCIDENTS Special Study, 1964 - 1974
27 May 1976 21 p
(PB-256591/9; NTSB-AAS-76-3) Avail: NTIS HC A02/MF A01 CSCL 01B

There are 7,856 weather involved aviation accidents which have occurred from 1964 through 1974. During the 11-year study period, inadequate preflight planning preparation and/or planning was the most frequently cited cause in which both pilots and weather were involved. Most of the nonfatal, weather involved general aviation accidents occurred during the landing regime, i.e., either during the landing roll or during leveloff and touchdown, when unfavorable wind conditions existed, and the weather was VFR. Unfavorable winds were cited 5 times more frequently as a cause or a factor than were low ceilings, and 16 times more frequently than was thunderstorm activity. GRA

N77-13026# Dikewood Industries, Inc., Albuquerque, N. Mex.
VISUAL COLLISION AVOIDANCE IN HIGH SPEED, LOW ALTITUDE TESTING AND TRAINING OPERATIONS Final Report
E. K. Stodola Apr. 1976 19 p
(Contract F29601-74-C-0022)
(AD-A024844; DC-TR-1242-16; AFSWC-TR-76-1) Avail: NTIS HC A02/MF A01 CSCL 01/2

This report considers numerically the collision contours and performance capabilities for aircraft of widely differing speed, and presents some of the implications of these considerations in respect to collision avoidance. Author (GRA)

N77-13027# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio.
EVALUATION OF AIR TRANSPORT ASSOCIATION (ATA-300) CONTAINER Final Report
Randle E. Dukes Jun. 1976 12 p
(AD-A026101; DSPT-76-20) Avail: NTIS HC A02/MF A01 CSCL 13/4

The purpose of this study was to conduct a further evaluation of an Air Transport Association Container type ATA-300 for possible use by Oklahoma City ALC/DSP to package and ship highly sensitive, high cost items. A previous study by this agency on this container is reported in DSPT Report No. 75-75. During free fall drop tests, the container performed satisfactorily with regard to shock protection. However, during corner and edge drops, the container fasteners became unlatched. Also, leakage occurred during pneumatic test of the container. To resolve these problems, the container was returned to the manufacturer for modification. Although the modified container did not meet Method II requirements of MIL-P-116, the improvements were so significant that it is believed that with the use of a better quality gasket material and more stringent quality control procedures, the leakage problem can be resolved. It was

determined that the problem with fasteners unlatching could be corrected by increasing the width of the striker plate. With the adoption of the above changes, it is believed this container can meet Method II requirements. Author (GRA)

N77-13028# Civil Aeronautics Board, Washington, D.C.
AIRPORT ACTIVITY STATISTICS OF CERTIFICATED ROUTE AIR CARRIERS, 30 JUNE 1974 - 30 JUNE 1975
1975 331 p Prepared in cooperation with the Federal Aviation Admin.
(AD-A026091) Avail: NTIS HC A15/MF A01 CSCL 01/2

This report furnishes airport activity of the Certificated Route Air Carriers. Included in the data are passenger enplanements, tons of enplaned freight, express, and mail. Both scheduled and non-scheduled service, and domestic and international operations are included. These data are shown by airport and carrier. Also included are departures by airport, carrier, and type of operation, and type of aircraft. GRA

N77-13029# Peat, Marwick, Mitchell and Co., San Francisco, Calif.
REPORT OF THE SAINT LOUIS AIRPORT INVESTIGATION, PHASE 2
Dan G. Haney Nov. 1975 317 p refs
(Contract DOT-OS-40176)
(AD-A026765; DOT-40716-8) Avail: NTIS HC A14/MF A01 CSCL 01/2

Based on forecasts of aviation activity presented in earlier reports under this contract, the Phase II investigation is a comparison of alternatives to meet the demand for air service in St. Louis. The study evaluated alternative transfer dates for initiation of air service from a proposed site near Columbia-Waterloo, Illinois, at 1985, 1990, 1995, and 2000. The evaluation considered economic and noneconomic impacts. Analyses were conducted of airport construction costs, airfield operations costs, airport access facilities costs, airport access travel costs, aircraft noise, air pollution, natural environment impacts, and community development and land use impacts. A financial evaluation was also conducted. A number of sensitivity analyses were also conducted to assist in comparing the alternatives. GRA

N77-13030# Naval Postgraduate School, Monterey, Calif.
TRENDS IN MAJOR AIRCRAFT ACCIDENT RATES Technical Report, Apr. - Jun. 1976
Gary K. Poock Jun. 1976 29 p refs
(AD-A027256; NPS-55PK76061) Avail: NTIS CSCL 01/2

A variety of approaches was taken to look for consistent cycles or trends in monthly major aircraft accident rates. Approaches are discussed looking at the data by years, commands and aircraft types. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N77-13031# Federal Aviation Administration, Washington, D.C.
FAA CATEGORY 3 INSTRUMENT LANDING SYSTEM: A GROUND EQUIPMENT DEVELOPMENT OVERVIEW Final Report
Carl G. Peterson Aug. 1976 79 p refs
(AD-A030150/7; FAA-RD-75-107) Avail. NTIS HC $5.00/MF A01 CSCL 17/7

Federal Aviation Administration, Systems Research and Development Service VHF/UHF Category III Instrument Landing System development efforts resulted in the establishment of operational Category IIIA ILS at various airports in the United States. Significant efforts and results are summarized. Major differences between the FAA MARK III ILS and other types of ILS are pointed out. Reliability aspects, the far field monitor, the maintenance monitor and the ILs monitor precision calibrator as part of the Category II ILS development are presented. Existing lightning problems and efforts to resolve these are covered. Author

N77-13032# Illinois Univ., Urbana-Champaign. Aviation Research Lab.
SIMULATOR TESTS OF PILOT PERFORMANCE IN TERMINAL AREA NAVIGATION OPERATIONS: EFFECTS OF VARIOUS AIRBORNE SYSTEM CHARACTERISTICS Final Report, Oct. 1974 - Jun. 1976
Richard S. Jensen and Roger W. Marsh May 1976 171 p refs
(Contract DOT-FA71WA-2574)
(AD-A029846/3; FAA-RD-76-99) Avail: NTIS HC $6.75/MF A01 CSCL 17/7

A simulator experiment was conducted in which 45 highly experienced pilots made five three-dimensional terminal area navigation flights each on a different parallel course offset. The experiment was designed to assess pilot performance as a function of three turn anticipation techniques (Procedural, Computed, and Electronic Map Display) and three levels of waypoint storage capacity (one, two, and three) on four different parallel course offsets (three and five miles left and right) and centerline. The flight task included SID, STAR, and approach procedures in the simulated Atlantic City area. Performance was measured on four variables: horizontal and vertical tracking, airspeed control, and procedural performance. Major findings included significant overall performance differences both among the three levels of turn anticipation and among the three levels of waypoint storage. The best overall performance was found in the two-waypoint, computed turn anticipation condition. Turn anticipation technique had its greatest effect on horizontal tracking and procedural performances. Waypoint storage was found to effect vertical tracking performance more than the other measured variables. The electronic map display was found to improve procedural performance but it had very little effect on other performance measures. Author

N77-13033# National Aviation Facilities Experimental Center, Atlantic City, N.J.
TEST AND EVALUATION OF ATCRBS ELECTRONIC SCAN ANTENNA (SYSTEM TEST) Final Report, Jan. 1973 - Jun. 1975
Anthony D. Bradley Aug. 1976 59 p refs
(AD-A029486/8; FAA-NA-75-73; FAA-RD-76-97) Avail: NTIS HC A04/MF A01 CSCL 17/9

The air traffic control radar beacon system (ATCRBS) experimental electronic scan antenna (ESA) consists of 56 array modules placed on a platform (ring) constructed around the top of an airport surveillance radar tower. A shelter beneath the tower provides an enclosure for the control and radiofrequency distribution system of the ESA. The system testing to demonstrate the ATCRBS ESA dynamic capabilities in typical terminal environment and to examine beacon monopulse performance is covered. The computer-controlled ATCRBS ESA demonstrated the automated features of the antenna, including agile beam management. In addition, the ATCRBS ESA monopulse target detection system was exercised during the flight test effort. This testing established that the field environment and aircraft maneuvering affected the resulting parameters of system operation (i.e., azimuth accuracy and received signal level). Basic monopulse target detection and processing is feasible for the ATCRBS. Author

N77-13034# Syracuse Univ., N.Y. Electrical and Computer Engineering Dept.
EFFECT OF SCATTERING BY OBSTACLES IN THE FIELD OF VOR/DVOR Final Report, Jun. 1974 - Jun. 1975
Harry Gruenberg and Kazuhiro Hirasawa Jul. 1976 112 p
(Contract DOT-FA73WA-3272)
(AD-A029405/8; FAA-RD-76-21) Avail: NTiS HC A06/MF A01 CSCL 17/7

Theoretical formulas, tables and graphs are presented which summarize the results obtained for the course deviation errors caused by scattering from wires and cylinders in the vicinity of a VOR station. A summary and an analysis of some experimental results are included. On the whole the agreement between theory

and experiment is satisfactory. A listing of modified and simplified computer programs is included. Author

N77-13035# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Aerospace and Electronic Systems Div.
A COMPUTER STUDY AND SITE ANALYSIS OF THE BOSTON, MASSACHUSETTS RUNWAY 4R GLIDE SLOPE SITE Interim Report
A. F. Zahorchak Feb. 1976 50 p
(Contract DOT-FA74WA-3360)
(AD-A030062/4; FAA-RD-76-57) Avail: NTIS HC A03/MF A01 CSCL 17/7

The performance of a compensated waveguide antenna at Logan International Airport Runway 4R was investigated. The waveguide antenna will maintain Category II performance with the threshold moved 1300 feet in front of its present location. The effect of the truncation of ground at the water edge is shown to be insignificant and the effect of a ship in the channel will not violate Category II requirements if 9 dB of coning is used. Author

N77-13036# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Aerospace and Electronic Systems Div.
INSTALLATION AND TEST OF THE COMPENSATED WAVEGUIDE ANTENNA AT BUFFALO, NEW YORK, RUNWAY 23 GLIDESLOPE SITE Interim Report, Jan. 1975 - Feb. 1976
R. Littlepage, R. A. Moore, G. Moussally, and A. F. Zahorchak Feb. 1976 77 p
(Contract DOT-FA74WA-3360)
(AD-A029488/4; FAA-RD-76-9) Avail: NTIS HC A05/MF A01 CSCL 09/5

By using previously developed techniques for digitally modeling terrain, an antenna site was determined which would provide Category II performance using the compensated waveguide antenna. The effects of reflections from the runway embankment and irregularities of the terrain were minimized by a combination of compensation, coning and antenna placement. Pattern measurements and antenna feed measurements provided information necessary for the installation and tuning of the antenna at Buffalo. Once installed, flight test information required small changes to the antenna feed system in order to meet Category II requirements. Initially, the monitor system exhibited some instability but this was solved by using new loops and reconfiguring the monitor channels. Author

N77-13037*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASA TRACKING SHIP NAVIGATION SYSTEMS
John J. McKenna Aug. 1976 31 p refs Presented at the Precise Time and Time Interval Meeting (PTTI), Dec. 1975
(NASA-TM-X-71228; X-814-76-190) Avail: NTIS MF A01/HC A03 CSCL 17G

The ship position and attitude measurement system that was installed aboard the tracking ship Vanguard is described. An overview of the entire system is given along with a description of how precise time and frequency is utilized. The instrumentation is broken down into its basic components. Particular emphasis is given to the inertial navigation system. Each navigation system used, a mariner star tracker, navigation satellite system, Loran C and OMEGA in conjunction with the inertial system is described. The accuracy of each system is compared along with their limitations. Author

N77-13038*# Research Triangle Inst., Research Triangle Park, N.C.
PRELIMINARY STUDY OF NAVSTAR/GPS FOR GENERAL AVIATION Final Report
R. D. Alberts and W. H. Ruedger Nov. 1976 82 p refs
(Contract NAS1-14302)
(NASA-CR-145059; Rept-43U-1228) Avail: NTIS HC A05/MF A01 CSCL 17G

The activities conducted as a planning effort to focus attention on the applicability of the global positioning system for general aviation are described. The description of GPS, its impact on economic and functional aspects of general aviation avionics, as well as a declaration of potential extensions of the basic concept have been studied in detail. Author

N77-13039*# Rensselaer Polytechnic Inst., Troy, N.Y.
COMPUTER SIMULATION AND EVALUATION OF EDGE DETECTION ALGORITHMS AND THEIR APPLICATION TO AUTOMATIC PATH SELECTION
Betsy A. Longendorfer Nov. 1976 89 p refs
(Grant NsG-7184)
(NASA-CR-149231; RPI-TR-MP-50) Avail: NTIS HC A05/MF A01 CSCL 17G

The construction of an autonomous roving vehicle requires the development of complex data-acquisition and processing systems, which determine the path along which the vehicle travels. Thus, a vehicle must possess algorithms which can (1) reliably detect obstacles by processing sensor data, (2) maintain a constantly updated model of its surroundings, and (3) direct its immediate actions to further a long range plan. The first function consisted of obstacle recognition. Obstacles may be identified by the use of edge detection techniques. Therefore, the Kalman Filter was implemented as part of a large scale computer simulation of the Mars Rover. The second function consisted of modeling the environment. The obstacle must be reconstructed from its edges, and the vast amount of data must be organized in a readily retrievable form. Therefore, a Terrain Modeller was developed which assembled and maintained a rectangular grid map of the planet. The third function consisted of directing the vehicle's actions. Author

N77-13040# Philips Gloeilampenfabrieken N. V., Eindhoven (Netherlands). Lighting Div.
VISUAL APPROACH SLOPE INDICATORS. PRINCIPLES OF OPERATION, RECOMMENDATIONS FOR INSTALLATION AND MAINTENANCE
Aug. 1975 44 p refs
(PHILIPS-ER-12) Avail: NTIS HC A03/MF A01

Installation and maintenance instructions for Visual Approach Slope Indicators are presented. This system is a precision aircraft approach and landing aid for day and night use, either stand-alone or in conjunction with radio and instrument aids. To fulfill the precision requirements, the system must be designed, set out, installed, and commissioned to a high degree of accuracy, as recommended. ESA

N77-13041# Philips Gloeilampenfabrieken N. V., Eindhoven (Netherlands). Lighting Div.
SI METRIC TERMS AND THEIR RADIOMETRIC AND PHOTOMETRIC DERIVATIONS
B. C. Templing Jan. 1975 13 p
(PHILIPS-ER-20) Avail: NTIS HC A02/MF A01

The International System of Units is presented, and relations are derived between radiometric and photometric terms and the various symbols and units used for indicating the different radiant and luminous quantities. ESA

N77-13042# Naval Air Engineering Center, Lakehurst, N.J. Engineering Dept.
ANALYSIS AND DESIGN OF AN ELECTRO-MECHANICAL OPTICAL LANDING SYSTEM FOR HELICOPTERS AT NIGHT IN VARYING SEA STATES
George E. Bray 27 May 1976 111 p refs
(AD-A025346; NAEC-ENG-7858) Avail: NTIS HC A06/MF A01 CSCL 01/2

This paper contains an analysis and design of an optical landing system for landing helicopters on small ships at night in heavy seas. The work involves analyzing an existing landing light and ship motions. From this analysis a platform capable of stabilizing the landing light was designed. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N77-13043*# Optimization Software, Inc., Los Angeles, Calif.
IMPROVEMENTS IN AIRCRAFT EXTRACTION PRO-

GRAMS
A. V. Balakrishnan and Richard E. Maine 1976 96 p refs
(Contract NAS1-13824)
(NASA-CR-145090) Avail: NTIS HC A05/MF A01 CSCL 01C

Flight data from an F-8 Corsair and a Cessna 172 was analyzed to demonstrate specific improvements in the LRC parameter extraction computer program. The Cramer-Rao bounds were shown to provide a satisfactory relative measure of goodness of parameter estimates. It was not used as an absolute measure due to an inherent uncertainty within a multiplicative factor, traced in turn to the uncertainty in the noise bandwidth in the statistical theory of parameter estimation. The measure was also derived on an entirely nonstatistical basis, yielding thereby also an interpretation of the significance of off-diagonal terms in the dispersion matrix. The distinction between coefficients as linear and non-linear was shown to be important in its implication to a recommended order of parameter iteration. Techniques of improving convergence generally, were developed, and tested out on flight data. In particular, an easily implemented modification incorporating a gradient search was shown to improve initial estimates and thus remove a common cause for lack of convergence. Author

N77-13044*# Massachusetts Inst. of Tech., Cambridge.
RESEARCH ON THE EXPLOITATION OF ADVANCED COMPOSITE MATERIALS TO LIGHTLY LOADED STRUCTURES Final Report
James W. Mar 30 Nov. 1976 130 p
(Grant NGR-22-009-781)
Avail: NTIS HC A07/MF A01 CSCL 01C

The objective was to create a sailplane which could fly in weaker thermals than present day sailplanes (by being lighter) and to fly in stronger thermals than present sailplanes (by carrying more water ballast). The research was to tackle the interaction of advanced composites and the aerodynamic performance, the interaction of fabrication procedures and the advanced composites, and the interaction of advanced composites and the design process. Many pieces of the overall system were investigated but none were carried to the resolution required for engineering application. Nonetheless, interesting and useful results were obtained and are here reported. Author

N77-13045# Lockheed-California Co., Burbank.
FEASIBILITY AND TRADEOFFS OF A TRANSPORT FUSELAGE FIRE MANAGEMENT SYSTEM Final Report, Jul. 1975 - Apr. 1976
P. Starrett, E. Lopez, B. Silverman, J. Susersky, and J. Logan Jun. 1976 168 p refs
(Contract DOT-FA75WA-3657)
(AD-A029242/5; FAA-RD-76-54; LR-27477) Avail: NTIS HC A08/MF A01 CSCL 01/3

A feasibility investigation and tradeoff analysis was performed on two approaches to increase fire safety for a hypothetical aircraft: an integrated fire management system, incorporating fire detection, monitoring, and suppression, and improved nonmetallic materials with greater fire retardancy and lower emission of hazardous pyrolysis products. Fire related accident and incident data over a 10-year period were analyzed. Then the fire safety aspects of the hypothetical aircraft were studied on a zone-by-zone basis. A survey was made of the relevant available technology to upgrade the aircraft fire protection. A fire detection, monitoring, and extinguishing system based on this technology was outlined. Candidate material improvements were identified. The two approaches were defined in terms of performance, economics, and timeliness. Performance and cost factors favored a fire management system over improved materials. Author

N77-13046# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE CALCULATION OF THE rms VALUE OF AN AIRCRAFT'S NORMAL ACCELERATION DUE TO GAUSSIAN RANDOM ATMOSPHERIC TURBULENCE
J. C. vanderVaart Mar. 1976 62 p refs
(VTH-213) Avail: NTIS HC A04/MF A01

It is shown that a theoretical calculation of the variance or rms value of an aircraft's normal acceleration due to atmospheric turbulence characterized by the Dryden or von Karman power spectral densities is not possible if the time delay, characterizing the gust penetration effect, is approximated by the linear time-derivative description allowing the use of the gust derivatives. Such a calculation is shown to be possible if a first order Pade approximation is used to describe the penetration effect. In the case of other motion variables, where the linear time derivative approximation is theoretically possible, the results of the Pade approximation are in better agreement with those obtained by a pure time delay. Neglecting the penetration effect (point approximation of the aircraft in the turbulent field) is shown to cause gross errors, especially in the variance of the normal acceleration at points some distance away from the aircraft's center of gravity. Monte Carlo simulations using analog computers and incorporating the time-derivative approximation of the gust penetration effect are shown to yield values of the variance of the normal acceleration that may be grossly in error depending, in a rather unexpected way, on the bandwidth of the electronic white noise generators used. Author (ESA)

N77-13047# European Space Agency, Paris (France).
INFLUENCE OF RUNWAY ROUGHNESS ON THE DYNAMIC BEHAVIOUR OF AIRCRAFT AT TAKE-OFF
Jean-Paul Drevet Oct. 1976 107 p refs Transl. into ENGLISH of 'Influence des Irregularites de Piste sur le Comportement Dyn. des Avions', ONERA, Paris Report ONERA-NT-1975-11, 1975
(ESA-TT-329; ONERA-NT-1975-11) Avail: NTIS HC A06/MF A01

Runway construction criteria based on reducing as far as possible the vertical accelerations on the flight deck of aircraft during take-off are defined. A mathematical model of the aircraft, taking into account the nonlinearities of the landing gear, was developed and programmed on a hybrid computer, making it possible to carry out a large number of take-off simulations on actual and theoretical runways. It was thus possible to reveal dangerous wavelengths and to analyze the effectiveness of the criteria used up till now. Some improvements are proposed.
Author (ESA)

N77-13048# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
ARMY PRELIMINARY EVALUATION YAH-1R IMPROVED COBRA AGILITY AND MANEUVERABILITY HELICOPTER, ADDENDUM Final Report
Robert L. Stewart, Floyd L. Dominick, Jr., and Raymond B. Smith Aug. 1975 48 p refs
(AD-A024850; USAAEFA-74-33-1-Add) Avail: NTIS HC A03/MF A01 CSCL 01/3

Follow-on testing of the YAH-1R helicopter was conducted subsequent to the Army Preliminary Evaluation (APE) of that aircraft. In the six test flights, emphasis was placed on evaluating maneuvering stability in high-speed diving flight and on investigation of engine/rotor system static and dynamic droop characteristics. This report is intended to amplify and expand the APE report and is not a rewrite of that report. In a dive at 155 KIAS, the YAH-1R was found to have stable maneuvering stability at normal load factors below 1.4 and neutral maneuvering stability at load factors above 1.4. The engine/rotor system static and dynamic droop characteristics were unaltered from those described in the APE report. In response to requests, the Army Aviation Systems Command acted to increase the engine output shaft speed limit to 6900 rpm for 10 seconds independent of power. This new proposed engine limit greatly reduces the pilot workload during rapid deceleration maneuvers; however, the engine/rotor speed increase was unaltered and thus remains a shortcoming. No additional deficiencies or shortcomings were determined during this evaluation; the conclusions of the APE report were unaltered. GRA

N77-13049# ARO, Inc., Arnold Air Force Station, Tenn.
MOTION ANALYSIS PROCEDURE FOR ASYMMETRIC VEHICLES Final Report, Jul. 1973 - Jun. 1975
C. J. Welsh and W. R. Lawrence AEDC May 1976 29 p refs
(AD-A024674; ARO-VKF-TR-75-83; AEDC-TR-75-158) Avail: NTIS HC A03/MF A01 CSCL 20/4

The report discusses a recently developed procedure for analysis of free-flight motion to determine the aerodynamic coefficients of a vehicle having appreciable aerodynamic and inertia

asymmetries. Aerodynamic data obtained by using this procedure in aeroballistic range tests of elliptic cross-section bodies indicate the potential usefulness of the developed procedure.
Author (GRA)

N77-13050# Army Aeromedical Research Lab., Fort Rucker, Ala.
REDUCTION OF GLARE FROM THE LANDING LIGHTS OF THE OH-58: AN EVALUATION OF FOUR POTENTIAL SOLUTIONS Final Report
Frank F. Holly May 1976 18 p refs
(AD-A025779; USAARL-76-21) Avail: NTIS HC A02/MF A01 CSCL 01/3

Four potential solutions to the OH-58 landing lights glare problem were evaluated. The four solutions consisted of: (1) placing a metal shield beneath each landing light; (2) placing shields on each side of the cockpit extending out laterally and forward from the instrument panel; (3) taping over the inside one-half of each chinbubble; and (4) taping over the sides of the plexiglass sheet and light well. The first three solutions were all found to be very effective but the preferred solution was the placing of shields beneath the landing lights (Solution 1) since this involved no visibility loss or extra material inside the cockpit. However, the overheating of the plexiglass sheet over the light well caused by these metal shields will have to be overcome before this solution is acceptable. It was also found that the tape over the inside one-half of each chinbubble is a very good field-expedient 'quick fix'. GRA

N77-13051# Army Aeromedical Research Lab., Fort Rucker, Ala.
ATTENUATION OF LIGHT TRANSMISSION IN ARMY AIRCRAFT TRANSPARENCIES DUE TO SLANTING Final Report
Wun C. Chiou, Chun K. Park, and Chris E. Moser Jun. 1976 57 p refs
(DA Proj. 3A0-62110-A-819)
(AD-A027664; USAARL-76-23) Avail: NTIS HC A04/MF A01 CSCL 01/3

The rates of light transmission reduction due to the slanting in eight fixed wing and fourteen rotary wing aircraft transparencies have been examined. It was found that the optical quality at various portions of the UH-1 transparencies and all the fixed wing samples possess similar characteristics of transmission reduction. The windscreen and the armor glass of CH-54 samples are similar too. But the tinted versus the clear AH-1G transparencies are quite different. The tinted sample generally has 27% spectral transmission loss compared to that of the clear sample. This reduction could constitute a dangerous loss of visibility for the aviator, especially during periods of reduced illumination and at night. The results presented in this study enable the potential users of the optical as well as the electro-optical devices to compute the amount of transmission reduction in most of the current Army aircraft. Author (GRA)

N77-13052# Douglas Aircraft Co., Inc., Long Beach, Calif.
MINIMIZATION OF AIRFRAME RESPONSE DURING GROUND OPERATIONS Final Report, 1 Mar. - 1 Dec. 1975
H. L. Love, R. M. Heimbaugh, and G. W. Kibbee Jan. 1976 182 p
(Contract F33615-75-C-3079; AF Proj. 1370)
(AD-A026393; AFFDL-TR-76-13) Avail: NTIS HC A09/MF A01 CSCL 01/2

This report describes an analytical study to determine practical, passive means of minimizing airplane responses during ground operations. The major objective of the study is to develop a design approach that will provide desirable airplane response characteristics during ground operations and be independent of airplane size. To establish the generality of the approach, the study investigates airplanes which have significantly different sizes. The three airplanes chosen to provide data for the study are the KC-135, B-52 and F-4. GRA

N77-13053# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
INSTRUMENT FLIGHT EVALUATION AH-1G HELICOPTER Final Report, Feb. 1973 - Dec. 1974
Gary L. Skinner, Gary A. Smith, Paul R. Bonin, Roger W. Waddell, Leslie J. Hepler, Robert K. Merrill, James S. Reid, and Morrie E. Larsen Jul. 1975 123 p refs
(AD-A026633; USAAEFA-72-29) Avail: NTIS HC A06/MF A01 CSCL 01/2

A limited evaluation of handling qualities and operational performance was conducted on the AH-1G helicopter to determine its suitability for operation under instrument flight conditions with the stability and control augmentation system ON and OFF are discussed. Tests were conducted intermittently from February 1973 to December 1974. Ten shortcomings were identified, and it is recommended that two of these should be corrected prior to release for flight in instrument conditions. GRA

N77-13054# Naval Test Pilot School, Patuxent River, Md.
INERTIALLY DERIVED FLYING QUALITIES AND PERFORMANCE PARAMETERS
W. C. Bowes and R. V. Miller 16 Jun. 1976 78 p refs
(AD-A026963; TPS-76-1) Avail: NTIS HC A05/MF A01 CSCL 01/2

A feasibility study was undertaken at the U. S. Naval Test Pilot School (USNTPS) in which an inertial navigation system in an A-7C airplane was successfully used to derive the conventional flying qualities and performance parameters which are used to describe an aircraft's motion. This report presents a discussion on the theoretical and practical aspects of using an inertial navigation system in flying qualities and performance testing. Also presented are some of the data obtained during the feasibility study and a discussion of the numerous advantages of using this concept for flight testing. The data obtained were extremely accurate, and the cost of instrumenting USNTPS A-7C airplanes was reduced significantly (in terms of dollars and aircraft down time) from using the conventional flight test instrumentation method. GRA

N77-13055# Calspan Corp., Buffalo, N.Y.
THE CAPABILITY OF THE T-2 AIRCRAFT AS A HIGH ANGLE-OF-ATTACK IN-FLIGHT SIMULATOR Final Report, Jun. - Dec. 1975
Paul R. Motyka Dec. 1975 78 p
(Contract N66269-75-C-0388)
(AD-A025359; CALSPAN-AK-5759-F-1) Avail: NTIS HC A05/MF A01 CSCL 01/3

This report documents the results of a conceptual control system study undertaken to determine the feasibility of employing a T-2, configured for variable stability operation, as a high angle-of-attack simulator and ascertain the envelope over which a valid simulation can be obtained. A model-following control system is defined that forces the T-2 to duplicate the motions of departing aircraft which exhibit characteristics of airplanes in the Navy inventory. The quality of simulation is excellent within an envelope defined by 15 deg in incremental angle of attack and + or - 15 deg in sideslip. A faithful reproduction of the predeparture and initial sudden departure motions of the model aircraft is obtained within this envelope and would allow for good training transfer in the difficult-to-train incipient departure region of flight. Techniques for modifying the model aircraft responses to increase the simulation capability of the variable stability T-2 are investigated. Several promising methods for doing this are developed and evaluated. Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N77-13056# National Aviation Facilities Experimental Center, Atlantic City, N.J.
INDEPENDENT ALTITUDE MONITOR: A LITERATURE SEARCH, ANALYSIS, AND BIBLIOGRAPHY Final Report, May 1974 - Jul. 1975
Jack J. Shrager Aug. 1976 50 p
(AD-A029541/0; FAA-NA-76-2; FAA-RD-76-127) Avail: NTIS HC A03/MF A01 CSCL 01/4

A literature search of recent activity to provide an independent indication of aircraft altitude was undertaken. There are several existing techniques in use which can readily be expanded to enhance altitude awareness to avoid inadvertent terrain collisions. Also identified are other new potential candidate systems concepts. Author

N77-13057*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPERATIONAL CHARACTERISTICS OF A CAPACITIVE POTENTIOMETRIC SHAFT ANGLE ENCODING TRANSDUCER
Ronald J. Hruby, Robert L. Wilson (Univ. of Santa Clara, Calif.), and Ralph A. Carestia (Univ. of Southern Colorado, Pueblo) Jul. 1976 17 p ref
(NASA-TM-X-73155; A-6696) Avail: NTIS MF A01/MF A02 CSCL 01D

An effort to develop a long-life replacement for a relatively short-life carbon potentiometric shaft angle transducer is outlined. A capacitive shaft angle encoder was designed and constructed for this purpose. The mechanical friction between the carbon potentiometer wiper and its carbon resistive element, necessary for electrical contact, was eliminated in the capacitive potentiometer. This friction caused the electrical properties to deteriorate and shorten the operational life of the carbon transducer when servo dither was present. The results of testing both of these transducers yielded a linearity characteristic for the capacitive encoder which was improved by a factor of twenty over the linearity of the carbon transducer. The granularity and RMS error measured for the capacitive device showed an improvement over the granularity and RMS error of the carbon potentiometer. Author

N77-13058# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT Semiannual Summary Report
Alan M. Kaniss 1 May 1976 156 p
(AD-A025182) Avail: NTIS HC A08/MF A01 CSCL 01/3

This report is a specialized summary of normal acceleration data recorded by counting accelerometers. Data are separated by calendar time and mission category. Only data reported in the counting accelerometer program are included. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N77-13059*# Pratt and Whitney Aircraft, East Hartford, Conn. Commercial Products Div.
EXPERIMENTAL CLEAN COMBUSTOR PROGRAM, PHASE 2 Final Report
R. Roberts, A. Peduzzi, and G. E. Vitti Nov. 1976 189 p refs (Contract NAS3-18544)
(NASA-CR-134969; PWA-5418) Avail: NTIS HC A09/MF A01 CSCL 21E

Combustor pollution reduction technology for commercial CTOL engines was generated and this technology was demonstrated in a full-scale JT9D engine in 1976. Component rig refinement of the two best combustor concepts were tested. These concepts are the vorbix combustor, and a hybrid combustor which combines the pilot zone of the staged premix combustor and the main zone of the swirl-can combustor. Both concepts significantly reduced all pollutant emissions relative to the JT9D-7 engine combustor. However, neither concept met all program goals. The hybrid combustor met pollution goals for unburned hydrocarbons and carbon monoxide but did not achieve the oxides of nitrogen goal. This combustor had significant performance deficiencies. The Vorbix combustor met goals for unburned hydrocarbons and oxides of nitrogen but did not achieve the carbon monoxide goal. Performance of the vorbix combustor approached the engine requirements. On the basis of these results, the vorbix combustor was selected for the engine demonstration program. A control study was conducted to establish fuel control requirements imposed by the low-emission combustor concepts and to identify conceptual control system designs. Concurrent efforts were also completed on two addendums: an alternate fuels addendum and a combustion noise addendum. Author

N77-13060*# Pratt and Whitney Aircraft, East Hartford, Conn.
STRESS ANALYSIS, THERMOMECHANICAL FATIGUE EVALUATION, AND ROOT SUBCOMPONENT TESTING OF GAMMA/GAMMA PRIME-DELTA EUTECTIC ALLOY Final Report
K. D. Sheffler and J. J. Jackson Dec. 1976 93 p refs (Contracts NAS3-19714; NAS3-19732)
(NASA-CR-135005; PWA-5472) Avail: NTIS HC A05/MF A01 CSCL 21E

Thermomechanical fatigue (TMF) and root subcomponent tensile, creep, and low cycle fatigue (LCF) tests were conducted to determine the capability of a fully lamellar directionally solidified eutectic alloy to sustain the airfoil thermal fatigue and root attachment loads anticipated in advanced, hollow, high work turbine blades. A three dimensional finite element elastic stress analysis was performed on typical advanced hollow eutectic airfoil and root-platform designs to determine appropriate conditions for these tests. Results of TMF tests conducted on longitudinal specimens (stress axis parallel to the solidification direction) containing a simulated leading edge cooling hole pattern indicated the longitudinal TMF properties to be more than adequate for the particular advanced hollow blade analyzed, with the strain range for a 10,000 cycle life being more than 50% above the maximum strain range calculated for the advanced hollow blade. Author

N77-13061*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PROGRAM FOR CALCULATING TURBOFAN-DRIVEN LIFT-FAN PROPULSION SYSTEM PERFORMANCE
Michael E. Tauber, Allen E. Fuhs, and John A. Paterson Oct. 1976 26 p
(NASA-TM-X-73173; A-6776) Avail: NTIS HC A03/MF A01 CSCL 21E

The performance of a turbofan-powered lift fan propulsion system for vertical takeoff and landing (VTOL) aircraft is calculated. The program formulation consists of taking bleed air from a turbofan engine, heating the bleed air in an interburner, and passing it through a tip turbine to drive a lift fan. Two options are available: bleed air from the engine exhaust, or bleed air that has passed through the engine fan only. This computer program will benefit persons unfamiliar with the thermodynamics of engine cycle analysis. Author

N77-13062*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
STATOR ROTOR TOOLS Patent Application
Donald D. Diamond, inventor (to NASA) (Serv-Air, Inc.) Filed 8 Nov. 1976 13 p Sponsored by NASA
(NASA-Case-MSC-16000-1; US-Patent-Appl-SN-739915) Avail: NTIS HC A02/MF A01 CSCL 21E

An apparatus and method for removing and reinserting base member segments in an arcuate slot was considered. It is in an engine part where each base member separately includes blades or stators comprising holding the engine part in place. It manipulates fingers on an arm into an interfitting abutting relationship with most of the blades on a base member and applies a torque force to the base of the blades to move a base member relative to such slot. NASA

N77-13063*# General Electric Co., Cincinnati, Ohio.
FIBER COMPOSITE FAN BLADE IMPACT IMPROVEMENT PROGRAM Final Report
T. L. Oller Dec. 1976 179 p refs (Contract NAS3-17836)
(NASA-CR-135078; R76AEG461) Avail: NTIS HC A09/MF A01 CSCL 21E

The results of a 20-month program, designed to investigate parameters which effect the foreign object damage resulting from ingestion of birds into fan blades are described. Work performed on this program included the design, fabrication, and impact testing of QCSEE fan blades to demonstrate improvement in resistance relative to existing blades and also the design and demonstration of a pin root attachment concept. Author

N77-13064*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COST/BENEFIT ASSESSMENT OF THE APPLICATION OF COMPOSITE MATERIALS TO SUBSONIC COMMERCIAL TRANSPORT ENGINES
J. R. Faddoul and R. A. Signorelli Nov. 1976 33 p refs
(NASA-TM-X-73557; E-8996) Avail: NTIS HC A03/MF A01 CSCL 21E

Results from a number of studies concerned with the cost and benefits of applying advanced composite materials to commercial turbofan engines are summarized. For each application area the optimistic and pessimistic benefit projections were averaged to arrive at a projected yearly percentage fuel savings for a commercial fleet of advanced technology transport aircraft. Engine components included in the summary are the fan section which includes fan blades, fan frame/case, and the blade containment ring; the nacelle; and the high pressure turbine blades and vanes. The projected fuel savings resulting from the application of composites are 1.85 percent for the fan section, 1.75 percent for the nacelle, and 2.35 percent for the high pressure turbine. Author

N77-13065*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERIM PREDICTION METHOD FOR TURBINE NOISE
Eugene A. Krejsa and Michael F. Valerino Nov. 1976 25 p refs
(NASA-TM-X-73566; E-9015) Avail: NTIS HC A02/MF A01 CSCL 21E

A turbine noise prediction method for interim use in the NASA Aircraft Noise Prediction Program is selected. The method predicts the level, directivity, and one-third octave band spectra of far field turbine noise as a function of engine parameters. The selection results from a review of turbine noise data and prediction methods available in the open literature. It is concluded that the state-of-the-art turbine noise prediction capability is primitive and that the selected method represents only a temporary interim approach. Recommendations are made on research requirements. Author

N77-13066*# Rockwell International Corp., Los Angeles, Calif. Aircraft Div.
INLET DISTORTION SCALING OF WIND TUNNEL MODEL RESULTS
Robert H. Johnson Dec. 1976 163 p refs
(Contract NAS4-2279)
(NASA-CR-143840; NA-76-458) Avail: NTIS HC A08/MF A01 CSCL 01C

Investigation of steady-state and time-dependent inlet flow distortion data from B-1 wind tunnel model tests was conducted to determine the effects of model scale, Reynolds number, and data processing. Existing engine face data from 0.1-, 0.2-, and 1.0-scale models were analyzed at mach numbers of zero, 0.85, and 2.2. The results include plots of total pressure recovery, steady-state and maximum dynamic distortion indexes, and turbulence versus airflow; contour plots of steady-state pressures, dynamic pressures, and turbulence; and distortion index time histories and summary plots. Additional data processing was performed to show the effect of frequency content on peak values of seven different distortion indexes, pressure contours, and the time history of a distortion index. Statistical analyses were made showing data stationarity and randomness. Mean values and standard deviations of distortion indices were used to predict peak values. Author

N77-13067# West Virginia Univ., Morgantown. Dept. of Aerospace Engineering.
INLET AND INTERNAL AERODYNAMICS OF A VTOL THRUST AUGMENTER Final Report, 1 Jan. 1975 - 31 Jan. 1976
John L. Loth, Subrato Chandra, and Edward H. Gibbs 31 Jan. 1976 96 p refs
(Contract N00014-75-C-0324; NR Proj. 215-227)
(AD-A027647; ONR-CR-215-227-3F; TR-49) Avail: NTIS HC A05/MF A01 CSCL 01/1

A new two dimensional thrust augmenter VTOL model has been designed, built and tested. The model has few moving parts and possibilities for good aerodynamic performance. A complete static test facility capable of supplying 30 psig air through 1.5 square inches nozzle for 2 minutes has been built for testing this model. The test rig can be moved in and out of ground effect by a fork lift. Instrumentation consists of strain gages to measure total lift and thrust. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N77-13068# Systems Technology, Inc., Hawthorne, Calif.
IDENTIFICATION OF MINIMUM ACCEPTABLE CHARACTERISTICS FOR MANUAL STOL FLIGHT PATH CONTROL VOLUME 1: SUMMARY Final Report
Roger H. Hoh, Samuel J. Craig, and Irving L. Ashkenas Jun. 1976 43 p refs
(Contract DOT-FA73WA-3276)
(AD-A029249/0; TR-1035-3R-Vol-1; FAA-RD-75-123-Vol-1) Avail: NTIS HC $4.00/MF A01 CSCL 01/3

Characteristics of powered lift STOL airplanes that lead to unacceptable flight path control for approach and landing are identified. Most of the findings are based on the results of a piloted ground based simulator program. However, a short variable stability flight test program was conducted to allow interpretation of the simulation landing results in light of a flight environment. Author

N77-13069# Systems Technology, Inc., Hawthorne, Calif.
IDENTIFICATION OF MINIMUM ACCEPTABLE CHARACTERISTICS FOR MANUAL STOL FLIGHT PATH CONTROL VOLUME 3: DETAILED ANALYSES AND TESTED VEHICLE CHARACTERISTICS Final Report
Robert H. Hoh, Samuel J. Craig, and Irving L. Ashkenas Jun. 1976 205 p refs
(Contract DOT-FA73WA-3276)
(AD-A029250/8; TR-1035-3R-III-Vol-3; Rept-TR-1035-3R-Vol-3) Avail: NTIS HC A10/MF A01 CSCL 01/3

Results and analysis procedures utilized to identify minimally acceptable flight path control characteristics of powered lift STOL airplanes are reported. Deficiencies in flight path control are identified via closed loop analysis of describing function results obtained during the simulation. Unacceptable characteristics for flare and landing are identified from correlations of pilot rating and commentary with key parameters obtained from closed loop pilot-vehicle analysis. Author

N77-13070*# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
A DUAL-MODE GENERALIZED LIKELIHOOD RATIO APPROACH TO SELF-REORGANIZING DIGITAL FLIGHT CONTROL SYSTEM DESIGN Final Report
15 Dec. 1976 41 p refs
(Grant NsG-1112)
(NASA-CR-149317; ESL-FR-707) Avail: NTIS HC A03/MF A01 CSCL 01C

Analytic techniques have been developed for detecting and identifying abrupt changes in dynamic systems. The GLR technique monitors the output of the Kalman filter and searches for the time that the failure occured, thus allowing it to be sensitive to new data and consequently increasing the chances for fast system recovery following detection of a failure. All failure detections are based on functional redundancy. Performance tests of the F-8 aircraft flight control system and computerized modelling of the technique are presented. I.M.

N77-13071# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
THE AUTOMATIC FLARE MANEUVER OF AN AIRLINER [DE AUTOMATISCHE AFVANGMANOEUVRE VAN EEN VERKEERSVLIEGTUIG]
J. C. VanderVaart Nov. 1974 53 p refs In DUTCH
(VTH-182) Avail: NTIS HC A04/MF A01

Results of a study on the symmetric motions during automatic landing of a medium large airliner (BAC-Super VC 10), are presented. The setting of an automatic pilot for such an aircraft was investigated with an analog computer. It appears that the open loop character of the control should be taken into account. The effect of variations in aircraft and flight state on the two most important parameters for landing, i.e., the location of the touchdown point and the descent velocity at the moment the wheels touch the ground, was examined. The effect of atmospheric turbulence was not considered. The effect of wind and wind gradient was studied and compared with British and American airworthiness specifications. ESA

N77-13072# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
THE DESCRIPTION OF PATCHY ATMOSPHERIC TURBULENCE, BASED ON A NON-GAUSSIAN SIMULATION TECHNIQUE
G. A. J. VandeMoesdijk Feb. 1975 113 p refs
(VTH-192) Avail: NTIS HC A06/MF A01

A model describing patchiness as sensed by the pilot was developed, the degree of patchiness being defined in mathematical terms. An existing technique of simulating patchy turbulence, intended to be used in piloted flight simulation, was extended, allowing patchiness to vary significantly. The model of patchiness was combined with the turbulence simulation technique, yielding analytical expressions for the patchiness parameters. A complete description of the model of patchiness is presented as well as a complete description of the statistical properties, including patchiness of each of the simulated turbulence components. Author (ESA)

N77-13073# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE IMPULSE RESPONSE METHOD FOR THE CALCULATION OF STATISTICAL PROPERTIES OF AIRCRAFT FLYING IN RANDOM ATMOSPHERIC TURBULENCE
J. C. VanderVaart Nov. 1975 54 p refs
(VTH-197) Avail: NTIS HC A04/MF A01

A fast and simple calculation of ensemble properties of output signals of a linear system perturbed by Gaussian stochastic input signals can be performed by the so-called impulse response method. This method applied to aircraft motions due to atmospheric turbulence has been derived previously from properties in the frequency-domain. The method is shown to be very directly derived, using simple basic concepts of modern system theory. A short recapitulation of the derivation, using frequency-domain techniques is given. It is shown that some minor corrections should be applied to the method as given previously. A numerical example gives an impression of the effect of these corrections on the results. A comparison was made with results of a rather different, digital calculation of the covariance matrix, and moreover, with results obtained by a Monte Carlo simulation. Author (ESA)

N77-13074# Air Force Academy, Colo.
THE EFFECT OF THRUST VECTORING ON AIRCRAFT MANEUVERING Final Report, Oct. 1971 - Aug. 1973
Duane M. Davis and Jerry D. Hines Jun. 1976 60 p refs
(AD-A027367; USAFA-TR-76-9) Avail: NTIS HC A04/MF A01 CSCL 01/2

A 3-dimensional minimum time turn optimal control problem was used as a framework for a preliminary investigation of the effects of thrust vectoring. Two basic configurations were used for aircraft in the study. They were the same except that one has the thrust vector fixed along the longitudinal axis, and the thrust vector for the other is free to move in the aircraft vertical plane. The effects of initial velocity, weight penalty and thrust-to-weight ratio were investigated. The results show a definite advantage for the thrust vectored aircraft for most of the conditions investigated and the possibility of an advantage for the others. Therefore, more detailed analysis of the effect of thrust vectoring on combat maneuverability is justified. Author (GRA)

N77-13075# Rockwell International Corp., Columbus, Ohio. Aircraft Div.
DIGITAL FLY-BY-WIRE TECHNOLOGY STUDY, VOLUME 1 Final Report, 3 Jul. 1975 - 2 Mar. 1976
William S. Andrews Mar. 1976 164 p refs
(Contract N62269-75-C-0423)
(AD-A027689; NR76H-33-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 01/3

This report documents the study conducted to determine the benefits and penalties associated with configuring the FV-12A high performance V/STOL aircraft with a Digital Fly-by-Wire flight control system. The items considered were reliability, maintainability, survivability, aircraft performance, mission effectiveness, and impact on life cycle costs. An analysis based upon weighting factors was defined to consolidate the benefits/penalties into an overall figure of merit. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N77-13076*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SIMPLIFIED METHOD FOR CALCULATING TEMPERATURE TIME HISTORIES IN CRYOGENIC WIND TUNNELS
Robert L. Stallings, Jr. and Milton Lamb Dec. 1976 16 p refs
(NASA-TM-X-73949) Avail: NTIS HC A02/MF A01 CSCL 14B

Average temperature time history calculations of the test media and tunnel walls for cryogenic wind tunnels have been developed. Results are in general agreement with limited preliminary experimental measurements obtained in a 13.5-inch pilot cryogenic wind tunnel. Author

N77-13077# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
CLIMATIC EFFECTS ON AIRPORT PAVEMENT SYSTEMS STATE OF THE ART Final Report, Oct. 1974 - May 1975
Barry J. Dempsey Jun. 1976 317 p refs
(Contract DOT-FA73WAI-377)
(AD-A029422/3; FAA-RD-75-196) Avail: NTIS HC $9.25/MF A01 CSCL 01/5

Topics reviewed include the climatic parameters important to airport pavement design, a methodology by which climatic parameters are used to predict pavement design parameters, and a methodology by which climatic parameters are incorporated into design procedures. Methods for predicting temperature and moisture conditions in the pavement system are discussed. The pavement distresses which result from temperature and moisture effects are also reviewed. A methodology for assessing the influence of climatic parameters on the properties of the airport pavement materials is discussed. Probabilistic procedures for evaluating the influence of climate on pavement systems are described. In conclusion, a brief summary of methodologies which could be used to include climatic parameters in airport pavement design is presented. Author

N77-13078# Southampton Univ. (England). Inst. of Sound and Vibration Research.
[RESEARCH ACTIVITIES OF THE INSTITUTE OF SOUND AND VIBRATION RESEARCH] Annual Report for the year ending Mar. 1976
1976 40 p
Avail: NTIS HC A03/MF A01

Activities of the Fluid Dynamics and Acoustic Group, the

Automotive Engineering, Operational Acoustics and Audiology, and Structural Dynamics Groups, as well as the Data Analysis Center, Electronic Research and Development Group, Industrial Noise and Condition Monitoring Groups, and Wolfson Unit for Noise and Vibration Control are reported. Academic awards, seminars, short courses and symposia, and service on external committees are also discussed. ESA

N77-13079# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France).

DEVELOPMENT AND TESTS OF A SIMULATOR FOR A PENDULUM ACCELEROMETER [ETUDE ET ESSAI D'UN SIMULATEUR D'ACCELEROMETRE PENDULAIRE]

Hochard 7 Jan. 1976 25 p In FRENCH
(LRBA-E-410-NT-32/SYE) Avail: NTIS HC A02/MF A01

A simulator for a pendulum accelerometer is presented for inclusion in a feedback loop without actually using an accelerometer. The electronic circuits are described including the provisions for changing the operating frequency, velocity amplification scaling factor, simulated stiffness of hinges, mechanical time constant, accelerometer bias, and overall residual error. ESA

N77-13080# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

THE HYBRID SIMULATION OF AIRCRAFT MOTIONS IN A PILOTED MOVING-BASE FLIGHT SIMULATOR

M. Baarspul and J. P. VanDooren 1976 167 p refs
(VTH-178) Avail: NTIS HC A08/MF A01

The main technical features of the general purpose moving-base piloted flight simulator of the Dept. of Aeronautics and Space Engineering are described. Description of the hybrid computer, the three-degree-of-freedom motion system, the simulator cockpit, the flight instruments, the control feel system, the flight director/autopilot, and the visual display system are included. The application of a simplified mathematical model to simulate aircraft dynamics in flight and after touchdown is discussed. Special attention is given to the aerodynamic effects of flap and landing-gear extension, aerodynamic ground effect, the simulation of the landing loads on the aircraft after touchdown and control force feel simulation. An important aspect of this piloted simulator is its ability to provide realistic motion cues. Solutions to the problem of generating drive commands for the constrained three-degree-of-freedom motion system are discussed. The hybrid computer program, used for the simulation of the approach and landing of a transport aircraft is described on the basis of system flow charts and analog diagrams. Author (ESA)

N77-13081# Technische Hogeschool, Delft (Netherlands). Dept of Aeronautical Engineering.

RELATIVELY CHEAP METHOD FOR THE MANUFACTURING OF TWO-DIMENSIONAL PLASTIC WIND TUNNEL MODELS WITH CAST PRESSURE DUCTS [EEN RELATIEF GOEDKOPE METHODE VOOR DE FABRIKAGE VAN TWEE-DIMENSIONALE KUNSTSTOF WINDTUNNELMODELLEN MET INGEGOTEN DRUKLEIDINGEN]

M. H. W. vanHeuven Aug. 1975 28 p In DUTCH
(VTH-202) Avail: NTIS HC A03/MF A01

A method is described for casting a plastic wind tunnel model of a wing profile using a displaceable casting mold. The two-dimensional model has a span width of 1.25 m and a chord of 0.36 m and contains pressure holes for determining the pressure distribution. The model is to be used in the 1.80 by 1.25 m test section of a low speed wind tunnel. ESA

N77-13082# European Space Agency, Paris (France).

REAL TIME MACH NUMBER CONTROL IN A TRANSONIC BLOWDOWN WIND TUNNEL Ph.D. Thesis - Paris VI Univ.

Jean-Louis Gobert Oct. 1976 80 p refs Transl. into ENGLISH of 'Commande en Temps Reel du Nombre de Mach dans une Soufflerie Transsonique a Rafales', ONERA, Paris Report ONERA-NT-1975-5, 1975
(ESA-TT-321; ONERA-NT-1975-5) Avail: NTIS HC A05/MF A01

Instrumentation for servo-controlling the Mach number in a transonic blow-down wind tunnel according to instructions given by the operator is discussed. Control is ensured numerically by means of a mini-computer working in real time. The process to be controlled was identified, i.e., wind tunnel behavior was determined; then control laws to be applied by the servo-system were sought. A rapid survey of classical aerodynamics is presented with a view to explaining the means of action on the Mach number and the measuring method used. Next, the study for determining the characteristics of the control system is described. Results of simulations carried out on the IRIS 80 computer of ONERA are given, and the method of installing the system on the site is explained. Author (ESA)

N77-13083# European Space Agency, Paris (France).

STUDY OF PROBLEMS RELATED TO THE DEFINITION AND THE DEVELOPMENT OF AN INDUCTION DRIVEN PRESSURIZED TRANSONIC WIND TUNNEL

Roger Michel, Claude Quemard, Andre Mignosi et al Oct. 1976 25 p refs Transl. into ENGLISH of 'Etudes des Probl. Lies a la Definition et a la Mise au Point d'une Soufflerie Transsonique Pressurisee a Induction', ONERA, Paris Report ONERA-TP-1975-101, 1975 Presented at the AGARD Conf. on Wind Tunnel Design and Testing Tech., London, 6-8 Oct. 1975 Original report in FRENCH previously announced as A76-14464
(ESA-TT-323; ONERA-TP-1975-101) Avail: NTIS HC A03/MF A01

The design, construction, operation, and optimization of an injector-driven pressurized wind tunnel representing a 1/10 scale model of a planned project for a very high Reynolds number transonic facility are described. Some preliminary results are reported regarding determination and optimization of performances in permanent regime, flow quality (pressure and velocity fluctuations), and analysis of unsteady phenomena during startup. Author (ESA)

N77-13084# European Space Agency, Paris (France).

WALL CORRECTIONS FOR THREE DIMENSIONAL TRANSONIC FLOW IN WIND TUNNELS WITH VENTILATED WALLS

Xavier Vaucheret, Jean Charles Vayssaire et al Oct. 1976 42 p refs Transl. into ENGLISH of 'Corrections de Parois en Ecoulement Tridimensionnel Transsonique dans des Veines a Parois Ventilees', ONERA, Paris Report ONERA-TP-1975-117, 1975 Original report in FRENCH previously announced as N76-25229
(ESA-TT-325; ONERA-TP-1975-117) Avail: NTIS HC A03/MF A01

The need for wall corrections is reviewed. Two methods for calculating the correction coefficients are considered: the analytic method and the vortex lattice method. The expected accuracy and some practical examples demonstrate the possibilities of these methods. Methods for determining wall porosity are analyzed. That of deriving the law defining the aerodynamic permeability as a function of Mach number is described. Some examples of their application to industrial tests illustrate the methods used. Criteria based on the confidence which can be placed in these corrections are founded on knowledge of the errors made in the corrections and on the scatter of the measurements. These criteria can be used to set up graphs to act as guides for determining the dimensions of wind tunnel models. Author (ESA)

N77-13085# European Space Agency, Paris (France).

TRANSONIC WIND TUNNEL WITH SELF-CORRECTING WALLS

Jean-Pierre Chevallier Oct. 1976 26 p refs Transl. into ENGLISH of 'Soufflerie Transsonique a Parois Auto-Adaptables', ONERA, Paris Report ONERA-TP-1975-119, 1975 Presented at the AGARD Conf. on Wind Tunnel Design and Testing, London, 6-8 Oct. 1975 Original report in FRENCH previously announced as A76-14462
(ESA-TT-326; ONERA-TP-1975-119) Avail: NTIS HC A03/MF A01

Flexible walls the dimensions and pressures of which can be altered to keep flow boundaries conforming to streamlines, with boundary-layer flow taken into account, are termed adaptive. A small finite number of converging iterated wall adjustments is needed. Wall shapes are determined using a digital comparator (with digital readout and storage). The slotted-wall square cross section wind tunnel can be modified by using deformable (flexible plastic) wall sections reinforced by lengthwise stiffening ribs, and with unevenly spaced rods placed closer to

the airfoil. Options for a three-dimensional arrangement are also offered. Author (ESA)

N77-13086# Laboratoire de Geophysique Externe du C.N.R.S., St. Maur-des-Fosses (France).
EXPERIMENT ARAKS: MEASUREMENT OF QUASI-STATIC NATURAL OR ARTIFICIAL ELECTRIC FIELDS AND OF THE ION TEMPERATURE USING RETARDING POTENTIAL ION ANALYZERS [EXPERIENCE ARAKS. MESURE DES CHAMPS ELECTRIQUES QUASI-STATIQUES NATURELS OU ARTIFICIELS ET DE LA TEMPERATURE IONIQUE PAR ANALYSEURS D'IONS A POTENTIEL RETARDATEUR]
J. J. Berthelier, D. Fouassier, M. Godefroy, G. Gogly, M. Pirre, and P. Thevenet Jan. 1976 114 p refs In FRENCH
(LGE-002) Avail: NTIS HC A06/MF A01

The Araks experiment for measurement of quasi-static natural or simulated electric fields using a dipolar probe and three retarding potential ion analyzers is described. These analyzers allow direct determination of the plasma drift velocity and, therefore, of the quasi-static electric fields (from weak natural fields to strong intensive artificial fields) as well as the ion temperature. The measurement principle is presented. The current connected by an analyzer is calculated. The principle of electric field measurement during the Araks experiment is reviewed and the experimental design is described. Results of tests obtained during plasma simulation are discussed. ESA

N77-13087# Air Force Human Resources Lab., Brooks AFB, Tex.
ADVANCED SIMULATOR PERFORMANCE SPECIFICATION FOR AN F-111 TEST STATION Final Report, Feb. - Oct. 1975
Gary G. Miller and Edward M. Gardner Nov. 1975 82 p refs (AF Proj. 1121)
(AD-A025853; AFHRL-TR-75-70) Avail: NTIS HC A05/MF A01 CSCL 05/9

This report contains performance specifications for a maintenance simulator to be used to train operation and maintenance of the 6883 Converter/Flight Controls Test Station for the F-111 aircraft. The maintenance simulator will be used in Air Force resident teaching to train techniques to perform intermediate level (I-level) maintenance tasks. The performance specification is the first phase of an effort to develop a prototype simulator. An improved technique for gathering task analytic data for making functional fidelity decisions is discussed. The basic design approach reported herein centers around a simulator that will look like the real equipment and exhibit psychologically similar outputs, but will not require the complex internal circuitry. Author (GRA)

N77-13088# Naval Training Equipment Center, Orlando, Fla.
LASER HELICOPTER GUNNER TRAINER Final Report, Jul. 1973 - Oct. 1975
Denis R. Breglia Jan. 1976 83 p refs
(AD-A024836; NAVTRAEQUIPC-IH-261) Avail: NTIS HC A05/MF A01 CSCL 05/9

The objective of this effort was to demonstrate the feasibility of using small, low power, visible lasers to simulate effect and tracers in a simulation system to train gunners in automatic weapon, direct fire techniques. The simulation of targets and background consists of a wide angle motion picture display. The trainee shoots from a simulated helicopter gun station. Laser produced spots on the display screen simulate incendiary hits and tracers with appropriate time of flight, windage and ballistic drop. The position of the spots on the screen is controlled by mirror deflection systems which are controlled indirectly by the weapon position and the simulated time-of-flight. Training potential evaluation by Marine Corps personnel from The Aerial Gunnery School, New River, indicates that the system concept is a valid training tool to supplement or enhance current gunnery training. Author (GRA)

N77-13089# Wisconsin Univ., Madison.
EXPERIMENTATION AND ANALYSIS TO PERFECT A SHOCK PERTURBATION TECHNIQUE Final Report
Hugh N. Powell Apr. 1976 42 p refs
(Contract DAAF03-71-C-0320; DA Proj. 1J5-62604-A-60)
(AD-A025351; RIA-R-CR-76-014) Avail: NTIS HC A03/MF A01 CSCL 14/2

The overall design of a shock tube has been validated with an extraordinary level of performance. It has been demonstrated that shock Mach numbers up to M* = 12 can be predicted to better than + or - 2% (95% confidence limits) and that the purely aerodynamic losses account for about a 1% decrease in the observed shock Mach numbers relative to the ideal performance values. These results set quite a new level of control for large high performance shock tube installations. The mechanical design work with complete reliability is demonstrated after extensive de-bugging of the combustion, control and test section. The diaphragm rupture and folding system also functions with complete reliability with respect to diaphragm tearing, etc., but a presently unresolved problem is a material failure which occurs after 15 to 20 shots. Author (GRA)

N77-13266# Technische Hochschule, Graz (Austria). Inst. fuer Nachrichtentechnik und Wellenausbreitung.
SOME ASPECTS OF SPECIAL METEOROLOGICAL EQUIPMENT
R. Lang *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 269-272 (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N77-13090*# National Bureau of Standards, Washington, D.C.
SPACELAB EXPERIMENT DEFINITION STUDY ON PHASE TRANSITION AND CRITICAL PHENOMENA IN FLUIDS: INTERIM REPORT ON EXPERIMENTAL JUSTIFICATION
M. R. Moldover, M. R. Hocken, R. W. Gammon, and J. V. Sengers Aug. 1976 99 p refs Prepared in cooperation with Maryland Univ., College Park
(NASA Order C-62861-C)
(NASA-CR-135070) Avail: NTIS HC A05/MF A01 CSCL 22A

Pure fluids and fluid mixtures near critical points are identified and are related to the progress of several disciplines. Consideration is given to thermodynamic properties, transport properties, and the complex nonlinear phenomena which occur when fluids undergo phase transitions in the critical region. The distinction is made between practical limits which may be extended by advances in technology and intrinsic ones which arise from the modification of fluid properties by the earth's gravitational field. The kinds of experiments near critical points which could best exploit the low gravity environment of an orbiting laboratory are identified. These include studies of the index of refraction, constant volume specific heat, and phase separation. Author

N77-13091*# Minnesota Univ., Minneapolis. Industrial Relations Center.
ORGANIZATIONAL STRATEGIES FOR PROTECTION AGAINST BACK CONTAMINATION Final Report
Thomas A. Mahoney 30 Jun. 1976 52 p refs
(Grant NGL-24-005-160)
(NASA-CR-149274) Avail: NTIS HC A04/MF A01 CSCL 22A

The organizational issues pertaining to the prevention of inbound contamination associated with possible Viking missions to Mars are considered. The completed Apollo missions, which returned samples from the moon, provide a convenient base for analysis of inbound contamination issues. Despite concern over the threat of inbound contamination from the moon and efforts to prevent back contamination, the back contamination efforts in the Apollo missions were considered ineffective had these missions encountered living organisms. Several alternatives for consideration in the design of future programs dealing with back contamination are examined and proposed for special consideration. Dissert. Abstr.

N77-13092# Academy of Sciences (USSR), Moscow. Space Research Inst.

STUDIES OF POSSIBLE APPLICATION OF CONTROLLED PROCESSES IN SPACE TECHNOLOGY
R. F. Ganiev, V. F. Laptchinsky, and A. S. Okhotin 1976 15 p refs
(D-238) Avail: NTIS HC A02/MF A01

In some cases it is expedient to produce different materials under zero-G conditions with the use of the controlled processes. One of the most acceptable controlled processes is nonlinear oscillation. Its use in the processes of substant crystallization and for the production of composite materials allows control of the structure and the properties of these materials. The theoretical foundations for using nonlinear oscillations in the various processes of space technology are presented. Results of experimental investigations of these processes under zero-G conditions were analyzed. These results were obtained by means of model substances and model installations such as vibrational mixing and formation of periodic layered structures in near zero G conditions and motions of gas bubbles and drops of liquid metals in oscillating liquid media in the condition of low or zero gravity. Author (ESA)

N77-13093# Academy of Sciences (USSR), Moscow. Space Research Inst.
INFLUENCE OF THE FORCE FIELD ON EUTECTIC STRUCTURE OF ALLOYS
A. S. Okhotin, L. K. Livanov, M. Y. Tzviling, and Y. V. Cheshlya 1976 13 p refs
(D-239) Avail: NTIS HC A02/MF A01

Alloy crystallization in space occurs in the absence of a gravitational field. The force field influence on the structure of eutectic alloys is dealt with. Crystallization of Pb-Sb and Bi-Cd alloys was carried out in the centrifuges with acceleration from 1 to 120 g at the rate of cooling 2 and 20 C/min. In the case of slow cooling of alloys (2 C/min) the force field influence consists in that eutectic is grinded and its morphology is changed. In the case of faster cooling (20 C/min) the force field does not exert sufficient influence on the electric structure, therefore, in alloys crystallized at 120 g the structure is more grinded after slow cooling than after fast cooling. Author (ESA)

N77-13094# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Neue Technologie.
POSSIBILITIES FOR INDUSTRIAL MATERIAL PRODUCTION AND PROCESSING TECHNIQUES IN SPACE FROM THE MECHANICAL ENGINEERING POINT OF VIEW
Erich Hau and Peter Leven Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1976 43 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRT-1074; GfW-RV-21-V-47/74)
(BMFT-FB-W-76-03) Avail: NTIS HC A03/MF A01; ZLDI, Munich, DM 8,65

An investigation carried out within the GHH Engineering Group into possible industrial applications for Spacelab resulted in 22 proposals. Following more detailed discussion, 8 of these proposals were selected, and certain basic requirements for their industrial application in the near future are given. These proposals can be separated into two groups: industrial heat-treatment and casting techniques for highly stressed precision machine components (e.g. turbine blades) and production of nonmetallic composite materials. Before any definitive conclusions regarding the suitability of these proposals can be reached, more detailed technological feasibility studies are necessary.
Author (ESA)

N77-13095# Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
RECOMMENDATIONS CONCERNING THE UTILIZATION OF THE MANNED SPACE LABORATORY SPACELAB FOR MATERIALS SCIENCE AND PROCESS ENGINEERING Final Report
May 1976 93 p refs In GERMAN; ENGLISH summary
(BMFT-FB-W-76-08) Avail: NTIS HC A05/MF A01; ZLDI, Munich, DM 19,15

On the basis of the results of pilot experiments under the U.S. Skylab and Apollo Soyuz test programs and in the framework of studies carried out under the German space program, and based on the expert knowledge and experience of its members, the ad hoc committee on the 'Preparation of experiments in applications-oriented materials and process research in space' assessed the significance of Spacelab utilization for the development of new technologies, in particular in the field of materials research and process engineering. The committee also assessed the utilization proposals submitted by German research and industry in this connection; recommendations are made for urgent supporting scientific and technological programs and for preparatory programs for the medium-term preparation of the relevant demand-oriented utilization programs. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N77-13096*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ORBIT MODELLING FOR SATELLITES USING THE NASA PREDICTION BULLETINS
N. L. Bonavito, D. W. Koch, G. A. Maslyar (Computer Sciences-Technicolor Assoc., Seabrook, Md.), and J. C. Foreman (Computer Sciences-Technicolor Assoc., Seabrook Md.) Oct. 1976 41 p refs
(NASA-TM-X-71235; X-932-76-254) Avail: NTIS HC A03/MF A01 CSCL 22A

For some satellites the NASA Prediction Bulletins are the only means available to the general user for obtaining orbital information. A computational interface between the information given in the NASA Prediction Bulletins and standard orbit determination programs is provided. Such an interface is necessary to obtain accurate orbit predictions. The theoretical considerations and their computational verification in this interface modelling are presented. This analysis was performed in conjunction with satellite aided search and rescue position location experiments where accurate orbits of the Amateur Satellite Corporation (AMSAT) OSCAR-6 and OSCAR-7 spacecraft are a prerequisite. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N77-13968 European Space Agency, Paris (France).
EQUIPPING THE B 61 SPACE SIMULATION FOR ELECTROSTATIC THRUSTER TESTS
Jean Labbe, Roger Benoist et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 91-96 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 55-57 Original report in FRENCH previously announced as A76-28756 (For primary document see N77-13962 04-99)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N77-13097*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB EXPERIMENT COMPUTER STUDY. VOLUME 1: EXECUTIVE SUMMARY (PRESENTATION)
James L. Lewis, Bobby C. Hodges, and James O. Christy Apr. 1976 68 p

(NASA-TM-X-73349-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 22B

A quantitative cost for various Spacelab flight hardware configurations is provided along with varied software development options. A cost analysis of Spacelab computer hardware and software is presented. The cost study is discussed based on utilization of a central experiment computer with optional auxillary equipment. Groundrules and assumptions used in deriving the costing methods for all options in the Spacelab experiment study are presented. The groundrules and assumptions, are analysed and the options along with their cost considerations, are discussed. It is concluded that Spacelab program cost for software development and maintenance is independent of experimental hardware and software options, that distributed standard computer concept simplifies software integration without a significant increase in cost, and that decisions on flight computer hardware configurations should not be made until payload selection for a given mission and a detailed analysis of the mission requirements are completed. L.S.

N77-13098*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB EXPERIMENT COMPUTER STUDY. VOLUME 2: STUDY ELEMENTS AND APPROACH
James L. Lewis, Bobby C. Hodges, and James O. Christy Apr. 1976 185 p
(NASA-TM-X-73349-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 22B

For abstract, see N77-13097.

N77-13099*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB EXPERIMENT COMPUTER STUDY. VOLUME 3: SPACELAB COST DATA
James L. Lewis, Bobby C. Hodges, and James O. Christy Apr. 1976 90 p
(NASA-TM-X-73349-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 22B

For abstract, see N77-13097.

N77-13100*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB EXPERIMENT COMPUTER STUDY. VOLUME 4: SPACELAB USER COST DATA (CENTRAL EXPERIMENT COMPUTER)
James L. Lewis, Bobby C. Hodges, and James O. Christy Apr. 1976 803 p
(NASA-TM-X-73349-Vol-4) Avail: NTIS HC A99/MF A01 CSCL 22B

For abstract, see N77-13097.

N77-13101*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB EXPERIMENT COMPUTER STUDY. VOLUME 5: SPACELAB USER COST DATA (DISTRIBUTED COMPUTER)
James L. Lewis, Bobby C. Hodges, and James O. Christy Apr. 1976 560 p
(NASA-TM-X-73349-Vol-5) Avail: NTIS HC A24/MF A01 CSCL 22B

For abstract, see N77-13097.

N77-13102*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATION OF REDUNDANCY IN THE SATURN 5 GUIDANCE AND CONTROL SYSTEM
F. Brooks Moore and J. B. White Nov. 1976 38 p refs Presented at the AIAA Guidance, Control and Flight Dyn. Conf., Huntsville, Ala., 14-15 Aug. 1967
(NASA-TM-X-73352) Avail: NTIS HC A03/MF A01 CSCL 22B

The Saturn launch vehicle's guidance and control system is so complex that the reliability of a simplex system is not adequate to fulfill mission requirements. Thus, to achieve the desired reliability, redundancy encompassing a wide range of types and levels was employed. At one extreme, the lowest level, basic components (resistors, capacitors, relays, etc.) are employed in series, parallel, or quadruplex arrangements to insure continued system operation in the presence of possible failure conditions. At the other extreme, the highest level, complete subsystem duplication is provided so that a backup subsystem can be employed in case the primary system malfunctions. In between these two extremes, many other redundancy schemes and techniques are employed at various levels. Basic redundancy concepts are covered to gain insight into the advantages obtained with various techniques. Points and methods of application of these techniques are included. The theoretical gain in reliability resulting from redundancy is assessed and compared to a simplex system. Problems and limitations encountered in the practical application of redundancy are discussed as well as techniques verifying proper operation of the redundant channels. As background for the redundancy application discussion, a basic description of the guidance and control system is included.
Author

N77-13103# Communications Research Centre, Ottawa (Ontario). Space Technology Branch.
THERMAL BEHAVIOUR OF THE FLEXIBLE SOLAR ARRAYS OF THE COMMUNICATIONS TECHNOLOGY SATELLITE
V. A. Wehrle, F. C. Yip, and S. J. Zurawski Oct. 1976 57 p refs
(CRC-1295) Avail: NTIS HC A04/MF A01

A thermal analysis was performed to investigate the thermal behavior of the deployed solar array of the Communications Technology Satellite. Continuum theory was used to derive equations for the temperature distributions on both the blanket and BI-STEM boom of the solar array, and the resulting set of coupled integro-differential equations is solved numerically by computer. The expected flight temperature profiles are given, and the thermal bending moments which arise in the BI-STEM boom, and which cause thermal distortion of the solar array, were computed an were found to be small. Thermally induced variations in position of the solar array from that at static equilibrium will be of inconsequential magnitude. Author

N77-13104# European Space Agency, Paris (France).
EXTREME UV-X RAY SURVEY SATELLITE (EXUV). REPORT ON THE MISSION DEFINITION STUDY
2 Jun. 1976 42 p refs
(ESA-DP/PS(76)-23) Avail: NTIS HC A03/MF A01

The EXUV waveband from 10 to 1000 angstrom has to date been largely neglected for technical and scientific reasons. A set of instruments to be flown on a free flyer satellite to study this waveband is described. Observations in the EXUV waveband are of great importance for the study of the conditions in the interstellar medium, stellar atmospheres, and stellar evolution. This waveband may be as rich in sources emitting primarily at these wavelengths as the medium energy X-ray region now studied in some detail. The instrument package consisting of two Baez telescopes and a spectrograph will within 1 year provide an unbiased map of the sky to a resolution of approximately 5 arc min. In addition the spectrograph will obtain detailed spectra of new sources in the EUV region from 100 to 1000 angstrom. The proposed experiment payload can be accommodated in a Scout launch spacecraft. The spacecraft design can use conventional technology and no special difficulties are foreseen. The estimated mass of the spacecraft is 129 kg including the 50 kg experiment mass. Author (ESA)

N77-13105# European Space Agency, Paris (France).
TRANSIENT X-RAY SOURCES SATELLITE. REPORT ON THE MISSION DEFINITION STUDY
14 Jun. 1976 42 p refs
(ESA-DP/PS(76)-25) Avail: NTIS HC A03/MF A01

A satellite mission for observations of the X-ray sky in the energy range from 2 to 20 keV is described. The mission is dedicated to the detection, observation, and monitoring of variable X-ray sources and should be carried out on a satellite orbiting below the radiation belts, providing the most benign environment in terms of charged particle background and its variability. Three instruments are considered appropriate for the mission: an all sky monitor, a rotation modulation collimator, and a narrow field of view instrument. Author (ESA)

N77-13106# Instituto Nacional de Tecnica Aeroespacial, Esteban Terradas, Torrejon de Ardoz (Spain).

INTASAT SATELLITE PROJECT: INFORMATION ON ONE YEAR'S FLIGHT [INTASAT PROYECTO DE SATELLITE. INFORME DE UN ANO DE VUELO]
G. A. Santullano Nov. 1975 208 p refs In SPANISH Original contains color illustrations
(INTA-D-3126) Avail: NTIS HC A10/MF A01

An analysis is presented at operational level of all aspects of the Intasat satellite and its mission during its one year orbital flight covering 4570 earth orbitals. The satellite was launched on November 15, 1974, from Western Test Range and contains a scientific experiment (a beacon transmitter for measurement of ionospheric electron content by Faraday rotation) and a technological experiment concerning radiation effects on C-MOS devices. Pass summaries covering in-flight subsystem data and flight data bulletins relating to the C-MOS experiment are presented in tabular form. ESA

N77-13107# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain). Dept. de Estudios Avanzados.
INTASAT PROGRAM: RADIO BEACON DATA ANALYSIS [PROGRAMA INTASAT. ANALISIS DE LOS DATOS DEL RADIOFARO]
Jose Luis SagredoRuiz Dec. 1975 71 p In SPANISH
(INTA-I-800-6-75) Avail: NTIS HC A04/MF A01

The satellite's radio beacon is described and experimental results of the first ionospheric electron content measurements, based on the Faraday effect, are reported. ESA

N77-13108# Laboratoire de Geophysique Externe du C.N.R.S., St. Maur-des-Fosses (France).
ARAKS 1975 EXPERIMENT: SOUNDING ROCKET ONBOARD SPECTRAL ANALYSIS INSTRUMENTATION Ph.D. Thesis - Conservatoire Natl. des Arts et Metiers [EXPERIENCE ARAKS 1975. CHAINES D'ANALYSE SPECTRALE EMBARQUEES SUR FUSEE-SONDE]
Richard Ney Paris Conservatoire Natl. des Arts et Metiers 22 Apr. 1976 161 p refs In FRENCH
Avail: NTIS HC A08/MF A01

Three separate spectral analysis instruments are described that were flown aboard an Eridan sounding rocket for the Araks experiment. The aim is to preprocess part of the waves generated by electron interaction with the ionosphere. The electron gun is at the lower part of the rocket while the onboard instrumentation is housed in an ejectable nose cone. Two sets of instruments deal with signals from an electric and magnetic antenna in the 7 to 100 MHz range. The third instrument deals with an electric dipole in the 5 to 100 MHz range. It is shown how the amplitude and frequency spectrum are adapted to the telemetry. ESA

N77-13109# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Dept.
GEOS NUTATION DAMPER DEVELOPMENT SCALE MODEL EXPERIMENTS REPRESENTATIVE FOR 12.4 rpm
L. J. Ancher 12 Nov. 1974 30 p
(FOK-RV-74-112) Avail: NTIS HC A03/MF A01

Results are presented of performance measurements of the GEOS nutation damper on a 0.5 : 1 scale model. The dampers are foreseen to contribute to damping the nutational motion in the operational phase of the satellite, when it has a spin rate of about 10 rpm. The scale model is representative for 12.4 rpm. Results agree with theory. ESA

N77-13110# Centre National d'Etudes Spatiales, Toulouse (France).
TESTING AND FABRICATION OF SOLAR ABSORBERS FOR THE D5A' SATELLITE [MISE AU POINT ET FABRICATION D'ABSORBEURS SOLAIRES POUR LE SATELLITE D5A']
Jacques Simon and Michel Riboulet (ONERA, Toulouse) May 1976 15 p refs In FRENCH; ENGLISH summary
(CNES-NT-37) Avail: NTIS HC A02/MF A05

A vacuum evaporated absorber coating consisting of layers of SiOx - NiCr - Al was developed for use on the French D5A' satellite. This coating has a solar absorptance coefficient of 0.70 and an infrared emittance coefficient of 0.045. Qualification tests (storage, humidity, thermal cycling, ultraviolet irradiation, particle irradiation, etc.) are reported. Author (ESA)

N77-13111# Centre National d'Etudes Spatiales, Toulouse (France).
PROBLEMS OF SURFACES FOR SPACE APPLICATION [PROBLEMES POSES PAR LES SURFACES DANS LES REALISATION SPATIALES]
Guy Bondivenne and Jean-Claude Hennequin Jun. 1976 104 p In FRENCH; ENGLISH summary
(CNES-NT-38) Avail: NTIS HC A06/MF A01

The effects of the environment on spaceborne surfaces are outlined. Correlations between space environment and the occurrence of failures on satellites are discussed. Problems connected with surfaces are exemplified for the Meteosat satellite. Friction and dry lubrication, mirrors and diffraction gratings, and the cryogenic radiator serve as topics to illustrate these problems in the fields of mechanics, optics, and thermo-optics. ESA

N77-13112# Centre National d'Etudes Spatiales, Toulouse (France).
EAST-WEST CORRECTIONS FOR A SYNCHRONOUS SATELLITE SUBJECTED TO GEOPOTENTIAL PERTURBATIONS [METHODE D'ETUDE DES CORRECTIONS EST-OUEST POUR UN SATELLITE SYNCHRONE SOUMIS AUX PERTURBATIONS DU POTENTIEL TERRESTRE]
Alain Esterle Jul. 1976 25 p refs In FRENCH; ENGLISH summary
(CNES-NT-40) Avail: NTIS HC A02/MF A01

The plane elements of a geosynchronous orbit are submitted to different perturbations. The most important are those caused by geopotential harmonics. A simple model describing their effect in the vicinity of any prescribed orbital location was developed. This gives a first approach to the stationkeeping correction philosophy in terms of the different orbital locations; however, an operational tool cannot be obtained from this method, for lunar-solar effects can no longer be neglected. Moreover the analysis is not valid in the vicinity of the equilibrium points. At that time a switch occurs in the order of magnitude of the perturbations. This fact was noticed in the case of Symphony (unstable equilibrium at 11 deg 5 East) and Anik 3 (stable equilibrium at 104 deg East). Author (ESA)

N77-13113# Centre National d'Etudes Spatiales, Toulouse (France).
ORBITAL CONDITIONS OF A GEOSYNCHRONOUS SATELLITE: EFFECTS INDUCED IN THE ORBITAL PLANE BY NORTH-SOUTH CORRECTIONS [CORRECTIONS D'ORBITES D'UN SATELLITE GEOSYNCHRONE: ETUDE DES EFFETS INDUITS DANS LE PLAN DE L'ORBITE PAR DES CORRECTIONS NORD-SUD]
Alain Esterle Jul. 1976 36 p refs In FRENCH; ENGLISH summary
(CNES-NT-41) Avail: NTIS HC A03/MF A01

The effect of attitude corrections for geostationary satellite stationkeeping by means of ion thrustors was investigated. It is essential to control perturbations induced in the orbital plane. These perturbations will closely depend on the attitude guidance mode during thrust. A model was set up for the evolution of the orbital plane, as well as a model for the in-plane perturbing effect. Three different hypotheses were chosen for the attitude guidance mode. The effect of the corrections on the in-plane orbital elements for each one is described. The results should be useful for feasibility studies of inclination corrections by ion thrustors. Author (ESA)

N77-13114# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Ground Equipment/ Materials Directorate.
MULTIPLE ROCKET LAUNCHER CHARACTERISTICS AND SIMULATION TECHNIQUE
Dean E. Christensen 5 Feb. 1976 38 p
(AD-A025379; RL-76-11) Avail: NTIS HC A03/MF A01 CSCL 19/7

This report provides an insight into the mallaunch associated with multiple firings of free flight rockets from a mobile platform. The effects of resonance with the structure and firing rate are presented. As the mass of the load decreases (as rockets are fired), the launcher's structural frequency changes and passes through this resonant condition. An analog simulation program developed to demonstrate this resonant condition, is included in

Appendix A. This program has been developed and is presented as a tool for future use. It will be useful in developing a General Support Rocket System. Curves presented show typical mallaunch values due to thrust misalignment and malaim magnitudes associated with multiple firings. GRA

N77-13115# Army Electronics Command, Fort Monmouth, N.J.
ARMY USER TEST PROGRAM FOR THE RDT AND EXM-75 METEOROLOGICAL ROCKET
Bruce W. Kennedy and Delbert Bynum Apr. 1976 43 p refs
(DA Proj. 1T1-62111-AH-71)
(AD-A024835; ECOM-5588) Avail: NTIS HC A03/MF A01 CSCL 19/7

The RDT and E XM-75 meteorological rocket was developed as a low-cost sounding system to meet the needs of several government agencies. Costs for the development were shared by the United States and Canada. After extensive development firings, the operational rocket was turned over to the agencies for the user test phase. This report describes results of the Army user program conducted at White Sands Missile Range, New Mexico, and Poker Flat, Alaska. Author (GRA)

N77-13116# Naval Research Lab., Washington, D.C.
INTERMODULATION CONSIDERATIONS FOR THE GAPFILLER SATELLITE Final Report
Arthur J. Ziffer and Cecil J. Waylan Apr. 1976 29 p
(NRL Proj. R01-58)
(AD-A024831; NRL-MR-3271) Avail: NTIS HC A02/MF A01 CSCL 17/2

The Navy intends to lease the UHF portion of the MARISAT Satellite system. This portion of the MARISAT, referred to by the Navy as GAPFILLER, consists of a wideband (500 kHz) and two narrowband (25 kHz) translating, hardlimiting, repeating channels. The current intent of the Navy is to utilize the wideband channel as 19 adjacent 25 kHz accesses. Because of nonlinear elements in the transmit chain of the satellites, multiple signal use creates intermodulation products in the transmitted spectrum. Some of these signals, although attenuated by filtering and antennae isolation, fall into the receive channel band. Because of the low power level of the desired signals to be received, these intermodulation products can cause serious degradation to satellite performance if not adequately suppressed. In addition to careful engineering and spacecraft design, frequency choice plays a significant role in determining the potential impact of intermodulation products on satellite operation. Since the frequency plan and operating access frequencies for GAPFILLER have been determined, it is the intent of this report to determine the order in which accesses should be eliminated from the satellite to decrease degradation of operation due to intermodulation product effects. GRA

N77-13117# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Aeroballistics Directorate.
ATTITUDE MEASUREMENT OF ROCKETS WITH OSCILLATING LASER BEAM
David B. Brown and Jerry W. Vickers 20 May 1976 32 p ref
(DA Proj. 1M3-62303-A-214)
(AD-A027374; RD-76-27) Avail: NTIS HC A03/MF A01 CSCL 17/8

A technique for attitude measurement of a nonrolling or slowly rolling vehicle in flight is described in this report. The technique employs a two-color, oscillating laser beam to sweep the flight vehicle. Light is retroreflected from on-board corner cubes to receivers colocated with the transmitter. The output consists of event times for the retroreflected pulses which may be used to infer pitch and yaw attitude. A mathematical model of the system is presented as well as a data reduction algorithm. Author (GRA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.
For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N77-13118*# TRW Defense and Space Systems Group, Houston, Tex. Systems Analysis Section.
FORMULATION OF DETAILED CONSUMABLES MANAGEMENT MODELS FOR THE DEVELOPMENT (PREOPERATIONAL) PERIOD OF ADVANCED SPACE TRANSPORTATION SYSTEM: EXECUTIVE SUMMARY
J. G. Torian Nov. 1976 30 p refs
(Contract NAS9-14264)
(NASA-CR-151115; TRW-26821-H001-R0-00) Avail: NTIS HC A03/MF A01 CSCL 22A

Formulation of models required for the mission planning and scheduling function and establishment of the relation of those models to prelaunch, onboard, ground support, and postmission functions for the development phase of space transportation systems (STS) was conducted. The preoperational space shuttle is used as the design baseline for the subject model formulations. Analytical models were developed which consist of a mission planning processor with appropriate consumables data base and a method of recognizing potential constraint violations in both the planning and flight operations functions. A flight data file for storage/retrieval of information over an extended period which interfaces with a flight operations processor for monitoring of the actual flights was examined. Author

N77-13119*# TRW Defense and Space Systems Group, Houston, Tex. Systems Analysis Section.
FORMULATION OF DETAILED CONSUMABLES MANAGEMENT MODELS FOR THE DEVELOPMENT (PREOPERATIONAL) PERIOD OF ADVANCED SPACE TRANSPORTATION SYSTEM. VOLUME 1: DETAILED REQUIREMENTS FOR THE MISSION PLANNING PROCESSOR
L. C. Connelly Nov. 1976 206 p refs
(Contract NAS9-14264)
(NASA-CR-151116; TRW-26821-H002-R0-00-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 22A

Detailed requirements for the mission planning processor are documented. The mission planning processor is a user oriented tool for consumables management and is part of the total consumables subsystem management concept. A quasi top-down approach was applied to the design of the mission planning processor. Interface requirements, input/output, and data base concepts were considered before computational processing. Existing analytical models were investigated for applicability before new models were developed. The mission planning processor was designed for an interactive system using demand terminals for input/outputdisplay and interfacing with an updateable mission data bank. The control and support routines provide the user interface, peripheral data handling, program control, and support functions required by the mission planning processor for execution on an interactive system. A description, interface requirements, definition of internal variables, listing of input data, processing flow diagram, and listing of output data are presented for each routine. Author

N77-13120*# TRW Defense and Space Systems Group, Houston, Tex. Systems Analysis Section.
FORMULATION OF DETAILED CONSUMABLES MANAGEMENT MODELS FOR THE DEVELOPMENT (PREOPERATIONAL) PERIOD OF ADVANCED SPACE TRANSPORTATION SYSTEM. VOLUME 2: CONSUMABLES DATA BASE WORKBOOK
M. A. Zamora Nov. 1976 130 p refs
(Contract NAS9-14264)
(NASA-CR-151117; TRW-26821-H003-R0-00-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 22A

The consumables characteristic data associated with the performance of the mission activities required by the mission planning processor are defined to calculate the consumables requirements. The activity data is defined in terms of discrete time periods having a distinct rate for each consumable

required to support the performance of a given operation. The data is structured in a series of consumable data worksheets for each activity that includes a profile of its operations and the rate of each consumable required to support the given activity. The data worksheets provide for the uniform specification of consumables data, allows for the ready identification of the consumables affected by a given activity, and facilitates the updating process. An activity and the data that must be included in the data worksheets are defined and an example of its use and application the consumables data requirements for the performance of the EVA are presented. Author

N77-13121*# TRW Defense and Space Systems Group, Houston, Tex. Systems Analysis Section.
FORMULATION OF DETAILED CONSUMABLES MANAGEMENT MODELS FOR THE DEVELOPMENT (PREOPERATIONAL) PERIOD OF ADVANCED SPACE TRANSPORTATION SYSTEM. VOLUME 3: STUDY OF CONSTRAINTS/LIMITATIONS FOR STS CONSUMABLES MANAGEMENT
C. M. Newman Nov. 1976 47 p refs
(Contract NAS9-14264)
(NASA-CR-151118; TRW-26821-H004-R0-00-Vol-3) Avail: NTIS MF A01/HC A03 CSCL 22A

The constraints and limitations for STS Consumables Management are studied. Variables imposing constraints on the consumables related subsystems are identified, and a method determining constraint violations with the simplified consumables model in the Mission Planning Processor is presented. Author

N77-13122*# TRW Defense and Space Systems Group, Houston, Tex. Systems Analysis Section.
FORMULATION OF DETAILED CONSUMABLES MANAGEMENT MODELS FOR THE DEVELOPMENT (PREOPERATIONAL) PERIOD OF ADVANCED SPACE TRANSPORTATION SYSTEM. VOLUME 4: FLIGHT DATA FILE CONTENTS
M. A. Zamora Nov. 1976 18 p
(Contract NAS9-14264)
(NASA-CR-151119; TRW-26821-H005-R0-00-Vol-4) Avail: NTIS MF A01/HC A02 CSCL 22A

The contents of the Flight Data File which constitute the data required by and the data generated by the Mission Planning Processor are presented for the construction of the timeline and the determination of the consumables requirements of a given mission. Author

N77-13123*# TRW Defense and Space Systems Group, Houston, Tex. Systems Analysis Section.
FORMULATION OF DETAILED CONSUMABLES MANAGEMENT MODELS FOR THE DEVELOPMENT (PREOPERATIONAL) PERIOD OF ADVANCED SPACE TRANSPORTATION SYSTEM. VOLUME 5: FLIGHT OPERATIONS PROCESSOR REQUIREMENTS
M. A. Zamora Nov. 1976 22 p
(Contract NAS9-14264)
(NASA-CR-151120; TRW-26821-H006-R0-00-Vol-5) Avail: NTIS MF A01/HC A02 CSCL 22A

The functional requirements for the Flight Operations Processor are defined. The Flight Operations Processor is that element of the Consumables Management System providing support during the flight operations. Author

N77-13124*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
ELEVON DESIGN REVIEW
Julian Barr Oct. 1976 167 p
(Contract NAS9-12200)
(NASA-CR-151127; LEC-7520; JSC-11131) Avail: NTIS HC A08/MF A01 CSCL 22B

The mathematical model implementation of the elevon subsystem for the shuttle actuators simulator in the Shuttle Avionics Integration Laboratory is described. The computer subsystem simulated two outboard and two inboard elevon actuators. Author

N77-13125*# Boeing Aerospace Co., Houston, Tex.
SHUTTLE FREEZER CONCEPTUAL DESIGN
B. W. Proctor and D. J. Russell 22 Aug. 1975 123 p
(Contract NAS9-13965)
(NASA-CR-151129; D2-118569) Avail: NTIS HC A06/MF A01 CSCL 06K

A conceptual design for a kit freezer for operation onboard shuttle was developed. The freezer features a self-contained unit which can be mounted in the orbiter crew compartment and is capable of storing food at launch and returning with medical samples. Packaging schemes were investigated to provide the optimum storage capacity with a minimum weight and volume penalty. Several types of refrigeration systems were evaluated to select one which would offer the most efficient performance and lowest hazard of safety to the crew. Detailed performance data on the selected, Stirling cycle principled refrigeration unit were developed to validate the feasibility of its application to this freezer. Thermal analyses were performed to determine the adequacy of the thermal insulation to maintain the desired storage temperature with the design cooling capacity. Stress analyses were made to insure the design structure integrity could be maintained over the shuttle flight regime. A proposed prototype freezer development plan is presented. Author

N77-13126*# Motorola, Inc., Scottsdale, Ariz. Government Electronics Div.
SHUTTLE/TDRSS Ku-BAND DOWNLINK STUDY Final Report
R. Meyer 30 Nov. 1976 230 p refs
(Contract NAS9-74843)
(NASA-CR-151134) Avail: NTIS HC A11/MF A01 CSCL 17B

Assessing the adequacy of the baseline signal design approach, developing performance specifications for the return link hardware, and performing detailed design and parameter optimization tasks was accomplished by completing five specific study tasks. The results of these tasks show that the basic signal structure design is sound and that the goals can be met. Constraints placed on return link hardware by this structure allow reasonable specifications to be written so that no extreme technical risk areas in equipment design are foreseen. A third channel can be added to the PM mode without seriously degrading the other services. The feasibility of using only a PM mode was shown to exist, however, this will require use of some digital TV transmission techniques. Each task and its results are summarized. Author

N77-13127*# Aerospace Corp., El Segundo, Calif. Vehicle Engineering Div.
ANALYSIS OF POGO ON THE SPACE SHUTTLE: ACCUMULATOR DESIGN GUIDELINES AND PLANAR MULTIENGINE MODEL DEVELOPMENT
M. H. Lock and S. Rubin 13 Sep. 1976 79 p refs
(Contract NAS9-14142)
(NASA-CR-151135; ATR-76(7475)-1) Avail: NTIS HC A04/MF A01 CSCL 22B

The design guidelines were generated to support the selection of the baseline accumulator configuration for the space shuttle. They were based upon the elimination of the instabilities that had been predicted for the shuttle system (in the absence of accumulators) using the single-engine model. The multiengine pitch plane stability model was subsequently developed to enable a more refined analysis of the pogo problem. The results obtained with this refined model, in the absence of accumulators, indicated a generally stable system. However, it was found that reasonable adjustment of the axial motion of the feedline aft support on the external tank could induce instability of the system. This instability was eliminated by the addition of high-pressure oxidizer turbopump inlet accumulators to the system. The results obtained with the refined model did not suggest a need to alter the design guidelines that had been obtained previously. The analyses with the multiengine model also treated the question of the use of a phase margin in the system stability requirements. Author

N77-13128*# TRW Defense and Space Systems Group, Redondo Beach Calif.
STS PAYLOADS MISSION CONTROL STUDY. VOLUME 2-A, TASK 1: JOINT PRODUCTS AND FUNCTIONS FOR PREFLIGHT PLANNING OF FLIGHT OPERATIONS, TRAINING AND SIMULATIONS Final Report

Jun. 1976 125 p refs
(Contract NAS9-14484)
(NASA-CR-151111; TRW-26904-H018-RO-00-Vol-2-A) Avail: NTIS HC A06/MF A01 CSCL 22A

Specific products and functions, and associated facility availability, applicable to preflight planning of flight operations were studied. Training and simulation activities involving joint participation of STS and payload operations organizations, are defined. The prelaunch activities required to prepare for the payload flight operations are emphasized. Author

N77-13129*# TRW Defense and Space Systems Group, Redondo Beach Calif.
STS PAYLOADS MISSION CONTROL STUDY CONTINUATION PHASE A-1. VOLUME 2-C, TASK 3: IDENTIFICATION OF JOINT ACTIVITIES AND ESTIMATION OF RESOURCES IN PREPARATION FOR JOINT FLIGHT OPERATIONS
Nov. 1976 83 p 4 Vol.
(Contract NAS9-14484)
(NASA-CR-151139; TRW-26904-H020-RO-00-Vol-2-C) Avail: NTIS HC A05/MF A01 CSCL 22B

Payload mission control concepts are developed for real time flight operations of STS. Flight planning, training, simulations, and other flight preparations are included. Payload activities for the preflight phase, activity sequences and organizational allocations, and traffic and experience factors to establish composite man-loading for joint STS payload activities are identified for flight operations from 1980 to 1985. Author

N77-13130*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF A LANDING GEAR LOADS TEST USING A 0.0405-SCALE MODEL (16-0) OF THE SPACE SHUTTLE ORBITER IN THE ROCKWELL INTERNATIONAL NAAL WIND TUNNEL (OA163), VOLUME 1
R. C. Mennell (Rockwell Intern., Los Angeles) Nov. 1976 435 p ref 4 Vol.
(Contract NAS9-13247)
(NASA-CR-147611; DMS-DR-2289-Vol-1) Avail: NTIS HC A19/MF A01 CSCL 01A

Experimental aerodynamic investigations were conducted on a sting mounted scale representation of the 140C outer mold line space shuttle orbiter configuration in the low speed wind tunnel. The primary test objectives were to define the orbiter landing gear system pressure loading and to record landing gear door and strut hingemoment levels. Secondary objectives included recording the aerodynamic influence of various landing gear configurations on orbiter force data as well as investigating 40 x 80 ft. Ames Wind Tunnel strut simulation effects on both orbiter landing gear loads and aerodynamic characteristics. Testing was conducted at a Mach number of 0.17, free stream dynamic pressure of 42.5 PSF, and Reynolds number per unit length of 1.2 million per foot. Angle of attack variation was 0 to 20 while yaw angles ranged from -10 to 10 deg. Author

N77-13131*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF A LANDING GEAR LOADS TEST USING A 0.0405-SCALE MODEL (16-0) OF THE SPACE SHUTTLE ORBITER IN THE ROCKWELL INTERNATIONAL NAAL WIND TUNNEL (OA163), VOLUME 2
R. C. Mennell (Rockwell Intern., Los Angeles) Nov. 1976 749 p ref 4 Vol.
(Contract NAS9-13247)
(NASA-CR-147612; DMS-DR-2289-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 01A
For abstract, see N77-13130.

N77-13132*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF A LANDING GEAR LOADS TEST USING A 0.0405-SCALE MODEL (16-0) OF THE SPACE SHUTTLE ORBITER IN THE ROCKWELL INTERNATIONAL NAAL WIND TUNNEL (OA163), VOLUME 3
R. C. Mennell (Rockwell Intern., Los Angeles) Nov. 1976 749 p ref 4 Vol.
(Contract NAS9-13247)
(NASA-CR-147613; DMS-DR-2289-Vol-3) Avail: NTIS HC A99/MF A01 CSCL 01A
For abstract, see N77-13130.

N77-13133*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF A LANDING GEAR LOADS TEST USING A 0.0405-SCALE MODEL (16-0) OF THE SPACE SHUTTLE ORBITER IN THE ROCKWELL INTERNATIONAL NAAL WIND TUNNEL (OA163), VOLUME 4
R. C. Mennell (Rockwell Intern., Los Angeles) Nov. 1976 749 p ref 4 Vol.
(Contract NAS9-13247)
(NASA-CR-147614; DMS-DR-2289-Vol-4) Avail: NTIS HC A99/MF A01 CSCL 01A
For abstract, see N77-13130.

N77-13134*# Bendix Corp., Denver, Colo. Guidance Systems Div.
FLOATED PALLET DEFINITION STUDY. VOLUME 1: EVALUATION OF ALTERNATE TELESCOPE POINTING SCHEMES Final Report
[1976] 113 p
(Contract NAS8-30889)
(NASA-CR-150102) Avail: NTIS HC A06/MF A01 CSCL 22A

Alternate telescope pointing schemes were evaluated. The performance of suspended pallet pointing was considered, as well as retention/suspension systems and pallet common module configurations. Author

N77-13135*# Bendix Corp., Denver, Colo. Guidance Systems Div.
FLOATED PALLET DEFINITION STUDY. VOLUME 2: SUSPENDED PALLET POINTING PERFORMANCE STUDY Final Report
[1976] 200 p refs
(Contract NAS8-30889)
(NASA-CR-150103) Avail: NTIS HC A09/MF A01 CSCL 22A
For abstract, see N77-13134.

N77-13136*# Bendix Corp., Denver, Colo. Guidance Systems Div.
FLOATED PALLET DEFINITION STUDY. VOLUME 3: RETENTION/SUSPENSION SYSTEMS, PALLET COMMON MODULE CONFIGURATION STUDY Final Report
[1976] 125 p refs
(Contract NAS8-30889)
(NASA-CR-150104) Avail: NTIS HC A06/MF A01 CSCL 22A
For abstract, see N77-13134.

N77-13137*# Bendix Corp., Denver, Colo. Guidance Systems Div.
FLOATED PALLET DEFINITION STUDY. VOLUME 4: SUMMARY VOLUME Final Report
Jul. 1975 125 p refs 4 Vol.
(Contract NAS8-30889)
(NASA-CR-150105) Avail: NTIS HC A06/MF A01 CSCL 22A

The conceptual design of a suspension system for the Floated Pallet and a retention system to support the pallet during launch, maneuvering and descent are described. In addition, a control moment gyroscope support equipment configuration study including installation and an experiment mount and erection study was performed. The impact of these separate hardware studies on the existing pallet configuration was assessed and a modified pallet common module defined. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

No abstracts in this category.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N77-13138*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CONTAMINATION FROM SKYLAB AS DETERMINED FROM THE SOLAR CORONAGRAPH DATA

James P. McGuire Dec. 1976 33 p refs

(NASA-TM-X-73353) Avail: NTIS HC A03/MF A01 CSCL 14B

The white light solar coronagraph was one of the scientific telescopes flown on Skylab to study the sun. It studied the sun's atmosphere located from 0.5 to 5.0 solar radii above the sun's limb. Such a telescope is so sensitive to contamination around the spacecraft that it caused a major contamination abatement program to be initiated at the conception of Skylab. The coronagraph's data is analyzed showing the successfulness of that abatement program. Author

N77-13139# Telespazio, S.p.A., Rome (Italy).

ON-BOARD AND GROUND DATA PROCESSING IN THE SPACELAB FOR EARTH RESOURCES

G. Bressanin [1975] 34 p refs

Avail: NTIS HC A03/MF A01

Requirements and characteristics were assessed. The ground data processing system will probably be non-dedicated. As a consequence many of the aspects related to data processing on the ground are much better defined than the corresponding data management problems for the spaceborne systems proper. The on-board data system is considered. The most promising methods for solving the system requirements are discussed with emphasis on new technologies such as optical and holography memories. The ground data processing system is examined. The main data processing techniques for earth resources applications are illustrated. Specific attention is paid to dedicated special purpose processors, which will extract useful information from the data in an efficient and cost-effective way. ESA

N77-13140# European Space Agency, Paris (France).

X-RAY SPECTROPOLARIMETRY FROM SPACELAB (EXSPOS). REPORT ON THE PHASE A STUDY

31 May 1976 96 p refs

(ESA-DP/PS(76)-20) Avail: NTIS HC A05/MF A01

The set of instruments described is to be flown on Spacelab for studies of the spectra of cosmic X-ray sources and for the detection of polarized X-ray emission. The proposed payload comprises a number of large area Bragg spectrometers, each selected for study of particular features in the range 0.5 to 10 keV. Doubly curved crystal spectrometer panels provide high sensitivity for X-ray line studies. These panels are also used as a high sensitivity polarimeter. High energy resolution at low energies is achieved using an X-ray grating with a large area Wolter I X-ray grazing incidence mirror. ESA

N77-13141# Laboratoire de Geophysique Externe du C.N.R.S., St. Maur-des-Fosses (France).

WAVE MEASUREMENT IN THE ARAKS EXPERIMENT [MESURE DES ONDES DANS L'EXPERIENCE ARAKS]

Jan. 1976 346 p refs In FRENCH

(Contract CNES-0571-74; CNES-0649-73; CNES-0632-72; CNES-0632-73)

(LGE-001) Avail: NTIS HC A15/MF A01

The instruments onboard the ARAKS platform aimed at measuring the electromagnetic waves generated by ionospheric interaction with an electron beam are presented. Magnetometers, electric antennas, and HF antennas are described together with their respective preamplifiers. The data processing in VLF and frequency analysis are detailed together with the sequencing device, the calibration, the ion analyzers, and the QT mode emitter. The interfaces, temperature, and vibration constraints and integration problems are outlined. ESA

N77-13142# European Space Research and Technology Center, Noordwijk (Netherlands).

AN INSTRUMENT-POINTING SYSTEM FOR SPACELAB

H. Heusmann, K. H. David, W. Fehse, and H. Samuelsson Paris ESA Sep. 1976 26 p refs

(ESA-TM-156-ESTEC) Avail: NTIS HC A03/MF A01

Many of the scientific experiments to be performed on Spacelab missions require accurate and stable pointing significantly better than that provided by the Orbiter vehicle. It is the purpose of the Spacelab Instrument Pointing Subsystem to satisfy those requirements. Three conceptual approaches to the problem are briefly described. The first, the soft-mounted, CMG-controlled pallet concept, originated with NASA (MSFC); the second, the conventional ring-gimbal concept, with the companies Dornier System and Messerschmitt-Bolkow-Blohm, Germany. The third concept, the inside-out gimbal system, is introduced by ESA and is described in more detail. The three concepts were compared with one another, and the inside-out gimbal system was found to be the preferred solution. Author (ESA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N77-13143*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.

ARGON HOLLOW CATHODE M.S. Thesis

Larry A. Rehn Nov. 1976 80 p refs

(Grant NsG-3011)

(NASA-CR-135102) Avail: NTIS HC A04/MF A01 CSCL 21C

An interest in alternate propellants for ion-bombardment thrusters, together with ground applications of this technology, has prompted consideration of argon. Several variations of conventional hollow cathode designs were tried, but the bulk of the testing used a hollow tube with an internal tungsten emitter and an orifice at one end. The optimum cathode tube diameter was found to be in the range of 1.0-2.5 cm, somewhat larger

than those used for cesium and mercury. Optimum orifice diameter depended on operating conditions, and varied from 0.5 to 5 mm. Biasing the internal emitter negative relative to the cathode chamber reduced the external coupling voltage and should therefore improve orifice lifetime. The expected effect of this bias on emitter lifetime was less clear. Lifetime tests were not conducted as part of this investigation, but several designs show promise of long lifetime in specific applications. Author

N77-13144*# Joint Publications Research Service, Arlington, Va.
LIQUID ROCKET SPACE ENGINES
V. N. Bychkov, G. A. Nazarov, and V. I. Prishchepa Washington NASA Dec. 1976 50 p ref Transl. into ENGLISH from Novoye v zhini, nauke, tekhnike; seriya kosmonavtika, astronomiya, (USSR), no. 9, 1976 p 1-64
(NASA Order W-13183)
(NASA-TT-F-17503) Avail: NTIS HC A03/MF A01 CSCL 21H

The design and use of liquid rocket engines in cosmonautics is discussed. The main liquid rocket engines of certain spacecraft including the Luna, Soyuz, Apollo, and Viking are considered. Monopropellant and bipropellant rocket engines are among the auxiliary rocket engines described. S.M.

N77-13145# Institut Franco-Allemand de Recherches, St. Louis (France).
HOLOGRAPHIC TESTING OF ROCKET COMBUSTION CHAMBERS Final Report [CONTROLE DES PROPULSEURS PAR HOLOGRAPHIE]
P. Smigielski and A. Stimpfling 1 Dec. 1975 100 p refs In FRENCH
(Contract DRME-73/785)
(ISL-R-134/75) Avail: NTIS HC A05/MF A01

The interferometric holography method was used to visualize adhesion defects between bonded materials simulating those existing in rocket propulsion systems. Nondestructive loads were applied, mostly pneumatic and thermal, to exhibit these defects. The nature and thickness of materials are influencing factors the effects of which were determined. Possible application to industrial tests is outlined. ESA

N77-13146# European Space Agency, Paris (France).
ELECTRIC POWER CONDITIONING FOR A THERMIONIC GENERATOR
Werner Kleinkauf Dec. 1975 125 p refs Transl. into ENGLISH of 'Elek. Energieaufbereitung fuer einen thermionischen Generator', DFVLR, Stuttgart Report DLR-FB-75-44, 27 May 1975 Original German report available from DFVLR, Cologne DM 41,30
(ESA-TT-216; DLR-FB-75-44) Avail: NTIS HC A06/MF A01

The design and experimental investigation of a power conditioning system for a satellite incore thermionic reactor (dc reactor) with 20 kW electric power output are described. The main subsystems are an electronically controlled bypass for high leakage power (greater than 2 kW) and a three-phase high current inverter. The bypass design criteria were minimum load of semiconductor elements and minimum generator current ripple. The inverter output voltage is a stepped quasi sinusoidal wave, with its effective value constant for input voltages varying between 5 and 9 V. A special ac voltage filter is considered for optimal reduction of harmonics. Computations of the fundamental frequency are presented which allow minimization of the weight of the total power unit. Author (ESA)

N77-13147# European Space Agency, Paris (France).
CONSIDERATIONS FOR HYBRID GAS GENERATORS FOR A RAMJET-ROCKET
Helmut Weiler Feb. 1976 25 p refs Transl. into ENGLISH of 'Ueberlegungen zu lithergolen Gasgeneratoren fuer eine Staustrahlrakete', DFVLR, Lampoldshausen, West Ger. Report DLR-Mitt-74-37, 9 Oct. 1974 Original German report available from DFVLR, Porz, West Ger. DM 12,60
(ESA-TT-251; DLR-Mitt-74-37) Avail: NTIS HC A02/MF A01

The performance of ramjet rockets using metallized fuels was investigated. The specific impulse of pure metals and metal-containing hybrid gas generators in airbreathing propulsion was calculated and plotted for equilibrium thermochemical conditions. The factors affecting the metal combustion are discussed for several metals and oxidizers. Nonequilibrium calculations were made for temperature and exhaust gas composition in the primary chamber in order to evaluate the conditions for metal ignition. Author (ESA)

N77-13148# Aerodyne Research, Inc., Bedford, Mass.
PLUME ATTENUATED RADAR CROSS SECTION CODE: USER'S MANUAL
J. Rickman, K. Tait, and D. Mann Jun. 1976 78 p refs
(Contract F04611-75-C-0021)
(AD-A026213; ARI-RR-68; AFRPL-TR-76-14) Avail: NTIS HC A05/MF A01 CSCL 17/9

The PARCS CODE calculates the coherent, incoherent, and overdense surface radar cross sections of a rocket plume. The modified Born approximation calculation includes attenuation, local index of refraction, Doppler shift and range cell truncation. The program accepts plume data directly from the AeroChem LAPP code, but may be interfaced with other sources of plume definition. Author (GRA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N77-13149 Emory Univ., Atlanta, Ga.
THE APPLICATION OF ELECTROCHEMISTRY TO SYNTHETIC ORGANIC CHEMISTRY Ph.D. Thesis
Richard Franklin Daley 1976 35 p
Avail: Univ. Microfilms Order No. 76-25071

Numerous conjugated carbonyl compounds have been subjected to the technique of controlled potential reduction. The dimeric products that arise from these reductions have been the object of much study. The bis enone was prepared for the purpose investigating the utility of the reductive coupling in perhydrophenanthrene synthesis. The angular methyl groups served as tagging substituents to allow the regio- and stereoselectivity of the reaction to be established via proton and carbon 13 nuclear magnetic resonance spectroscopy. The coupling reaction was found to be both regio- and stereospecific resulting in 80% yield. Dissert. Abstr.

24 COMPOSITE MATERIALS

Includes laminates.

N77-13150 British Library Lending Div., Boston Spa (England).
CHEMICAL PRECIPITATION OF DISPERSION LAYERS WITH NICKEL-PHOSPHOROUS MATRIX AND INCORPORATION OF SILICON CARBIDE
G. Gawrilov and C. Erinin [1976] 9 p refs Transl. into ENGLISH from Galvanotechnik (West Ger.), vol. 66, no. 5, 1975 p 397-401
(BLL-RTS-10085) Avail: British Library Lending Div., Boston Spa, Engl.: £5.00; 7 BLL overseas or 21 UK BLL photocopy coupons

The incorporability of SiC particles during currentless nickel-precipitation using hypophosphite or borhydride as the reducing agent was studied. The experiments performed and results obtained are discussed. Factors examined include SiC concentration in the layers, structure of Ni-P-SiC layers; and properties of Ni-P-SiC dispersion layers. J.M.S.

N77-13151 British Library Lending Div., Boston Spa (England).
QUALITY CHARACTERISTICS OF PACKING MATERIALS AS A CRITERION OF THEIR SUITABILITY AS PHARMACEUTICAL PACKINGS
D. Herrmann and E. Kobel [1976] 30 p refs Transl. into ENGLISH from Pharm. Ind. (West Ger.), vol. 36, no. 11a, 1974 p 849-856
(BLL-RTS-10212) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; 13 BLL overseas or 39 UK BLL photocopy coupons

Principles for material selection for pharmaceutical containers are listed. The normal test methods used are described. Reference is made to the internal container materials in direct contact with the pharmaceutical preparation. Outer packing components are considered when they affect the stability of the preparation, such as protection against light, and permeability to water vapor. Author

N77-13152 Tennessee Univ., Knoxville.
ON THE ELASTIC-PLASTIC FRACTURE ANALYSIS OF ADVANCED FIBER COMPOSITE MATERIALS Ph.D. Thesis
Harihar Trimbak Kulkarni 1976 212 p
Avail: Univ. Microfilms Order No. 76-24838

Analytical studies were carried out to predict failure of glass-fiber reinforced epoxy composites whose load axis was not coincident with the fiber axis. The extension of this theory to notched specimen of unidirectional and cross-plied composites was also investigated. The experimental data which resulted from this program confirmed the applicability of the theory which resulted from these programs. Metal matrix composite material analogous to boron-aluminum, was analyzed using finite element techniques. The effects of matrix plasticity on the internal stress distribution were investigated. Computer programs were developed which allow failure criteria to be advanced, based on the J-integral, R-curve, and compliance techniques. Dissert. Abstr.

N77-13153 Delaware Univ., Newark.
DEFORMATION AND FATIGUE IN POLYCARBONATE Ph.D. Thesis
Tzu-Guu Teng 1976 180 p
Avail: Univ. Microfilms Order No. 76-24270

Polycarbonate was tested under uniaxial tensile stress in air at room temperature. Micro-shear-band formation was observed to be associated with stress raisers, probably macromolecular clusters. Preludes of crazes were observed when micro-shear-band formation was completed. Crazes were initiated from these preludes and continued to grow under uniaxial tensile stress. Associated micro-shear-bands diminished and finally vanished as crazes grew. Treatment with tertiary butylamine inhibited shear band and craze formation. Evidence is given that the suggestion that shear bands are formed at the craze ends under tensile stress probably has to be limited to the necking area only. Dissert. Abstr.

N77-13154+ Ecole Superieure de Chimie, Mulhouse (France). Lab. de Chimie Physique.
IMPROVEMENT OF CARBON FIBER PROPERTIES IN VIEW OF THEIR UTILIZATION IN COMPOSITE MATERIALS Final Report [AMELIORATION DES PROPRIETES DES FIBRES DE CARBONE EN VUE DE LEUR UTILISATION DANS LES MATERIAUX COMPOSITES]
Jean-Baptiste Donnet Dec. 1975 24 p refs In FRENCH; ENGLISH summary
(Contract DGRST-72-7-0855)
Avail: NTIS HC A02

Carbon and graphite fibers were subjected to anodic etching in acidic, alkaline, and saline medium. The change in mechanical and surface properties of the fibers was plotted as a function of the treatment time and of the nature of the electrolyte. The shear strength of epoxy resin carbon fiber composite is significantly improved after electrochemical etching of the fibers. Values of shear strength better than 9 hbars are obtained for composites containing 75 % in weight of carbon fiber. The influence of the nature and of the content of acidic surface groups of the fiber on the value of shear strength and on the failure mode of the composite has been shown. Author (ESA)

N77-13155+ Kleber-Colombes (France). Centre de Recherche.
REINFORCEMENT OF COMPOSITE MATERIALS CONSISTING OF ELASTOMERS AND VARIABLE PLASTICITY FILLERS Final Report [ETUDE DU RENFORCEMENT DANS LES MATERIAUX COMPOSITES CONSTITUES PAR DES ELASTOMERES ET DES CHARGES DE PLASTICITE VARIABLE]
Y. Landler, J. P. Nottin, and G. Evrard May 1975 42 p refs In FRENCH
(Contract DGRST-73-7-1707)
Avail: NTIS HC A03

The reinforcing properties of semicrystalline polyolefins, finely dispersed in rubber, as filler material in composite materials were investigated. A series of high density polyethylenes was selected to study the major parameters determining the reinforcing character of this new type of filler. The fineness of the particles appears to be the factor determining reinforcement, especially for medium and large deformations where it delays the fracture phenomenon. The sensitivity of the composite material to high temperatures and its deformability at a given temperature are largest when the molecular mass of the polyethylene is low. ESA

N77-13156*# CTL-Dixie, Inc., Cincinnati, Ohio.
DESIGN CONCEPTS FOR A COMPOSITE DOOR FRAME SYSTEM FOR GENERAL AUTOMOTIVE APPLICATIONS
John A. Tauber Apr. 1976 56 p refs
(NASA Order C-79821-C)
(NASA-CR-135111) Avail: NTIS MF A01/HC A04 CSCL 11D

Conceptual design, manufacturing process, and costs are explored to determine the feasibility of replacing present steel parts in automotive door structures with various composite materials. The problems of conforming to present anti-intrusion specifications with advanced materials are examined and discussed. Modest weight reductions, at competitive costs, were identified for the utilization of specific composite materials in automotive door structures. Author

N77-13157*# General Electric Co., Schenectady, N.Y.
STUDY OF IMPROVED RESINS FOR ADVANCED SUPERSONIC TECHNOLOGY COMPOSITES. PART 1: HETEROAROMATIC POLYMERS CONTAINING ETHER GROUPS. PART 2: CURING CHEMISTRY OF AROMATIC POLYMERS AND COMPOSITE STUDIES Final Report, 12 Feb. 1973 - 30 Jun. 1975
T. Takekoshi, W. B. Hillig, and G. A. Mellinger Jul. 1975 98 p refs
(Contract NAS1-12079)
(NASA-CR-145007) Avail: NTIS HC A05/MF A01 CSCL 11D

Fourteen ether-containing, aromatic dianhydrides have been synthesized from N-phenyl-3 or 4-nitrophthalimide and various bisphenols. The process involves nucleophilic displacement of activated nitro groups with bisphenolate ions. Ether-containing dianhydrides were indefinitely stable in the presence of atmospheric moisture. One-step, high temperature solution polymerization of the ether-containing dianhydrides with m-phenylene diamine, 4,4'-oxydianiline and 1, 3-bis(4-aminophenoxy)benzene afforded 42 polyetherimides. The polyetherimides were all soluble in m-cresol except two which were found to be crystalline. The glass transition temperatures of the polyetherimides ranged from 178 to 277 C. Soluble polybenzimidazopyrrolones containing ether groups were also prepared from the same ether-containing dianhydrides and aromatic tetraamines by one-step solution polymerization. Using low molecular weight polyetherimides, various thermoset resin systems were developed and tested as matrices for fiber-reinforced composites. The curing chemistry involving reaction of the phthalonitrile group and the o-diaminophenyl group was found to be generally applicable to crosslinking various aromatic polymers other than polyimides. Author

N77-13158# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
FAILURE LIMITS OF HYBRID MATERIALS
Bonn Bundesmin. fuer Forsch. u. Technol. Aug. 1976 275 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-W-76-13) Avail: NTIS HC A12/MF A01; ZLDI, Munich DM 60.70

The nonlinear elastic properties of glass-epoxy (E-glass), carbonepoxy (Thornel 75 S) and kevlar-epoxy were evaluated under either longitudinal shear or transverse normal loading both experimentally and analytically. The theoretical values correspond very well with the test results. A complete digital computer program was developed to predict both initial and post yielding

behavior of mixed modulus composites, taking into consideration the nonlinear elastic properties. For individual titles, see N77-13159 through N77-13161.

N77-13159 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
MODIFICATION OF STRATIFIED RUPTURE ANALYSIS
Fritz Och *In its* Failure Limits of Hybrid Mater. Dec. 1973 38 p refs In GERMAN; ENGLISH summary (For primary document see N77-13158 04-24)
(BMFT-FB-LFF-73)

For calculation of strength properties of hybrid fibercomposites, the relations of the elastic constants were derived assuming a quadratic fiber array. An experimental and an analytical method is proposed to evaluate the nonlinear properties of unidirectional laminae. Certain failure criteria are discussed as applied to hybrid fiber composites. To estimate experimentally the nonlinear material properties, a tubular test specimen was chosen, the fabrication of which is reported. Author (ESA)

N77-13160 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
DETERMINATION OF NONLINEAR MATERIAL PROPERTIES
Fritz Och and Ulrich Ramm *In its* Failure Limits of Hybrid Mater. Aug. 1975 138 p refs In GERMAN; ENGLISH summary (For primary document see N77-13158 04-24)
(BMFT-FB-LFF-75-32)

With tubular specimens made of glass fiber (E-glass), carbon fiber (Thornel 75S) and kevlar fiber composites the nonlinear mechanical properties of laminae were evaluated under either longitudinal shear or transverse normal loading (tension and compression). Theoretical values of the nonlinear stiffness properties were obtained, using digital computer programs to predict the stress distribution in the fiber and matrix under either longitudinal shear or transverse normal loading. The fiber properties could be transversely isotropic and the matrix was assumed to be nonlinear elastic. The theoretical values correspond very well with the test results. Author (ESA)

N77-13161 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
COMPUTER PROGRAM FOR THE STRENGTH ANALYSIS OF FIBER REINFORCED HYBRID LAMINATES
Peter Martin Wackerle *In its* Failure Limits of Hybrid Mater. Aug. 1975 92 p refs In GERMAN; ENGLISH summary (For primary document see N77-13158 04-24)
(BMFT-FB-LFF-75-32)

The computer program HYBRUCH for strength analysis of fiber reinforced hybrid laminates is described. A summary of the theory of multilayered composites is given and the flow chart of the program is shown. For the user there is an introduction to data input and program control. For program checking and as an example some test calculations are included. ESA

N77-13162# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
INVESTIGATION OF THE FAIL-SAFE PROPERTIES OF LAMINATED SHEET MATERIAL [ONDERZOEK NAAR DE FAIL SAFE EIGENSCHAPPEN VAN GELAMINEERD PLAATMATERIAAL]
J. Schijve and H. T. M. VanLipzig Oct. 1974 58 p refs In DUTCH; ENGLISH summary
(VTH-188) Avail: NTIS HC A04/MF A01

Tensile tests, fatigue crack propagation tests (R = 1/3), and residual strength tests were carried out on single sheet specimens, laminated sheet specimens (adhesive bonding), and stiffened panels with two small stringers, including bonded and integral stiffening. All specimens were made from 2024-T3 Alclad; the adhesive was FM 123/5. Fatigue crack propagation data were correlated by the stress intensity factor. A tip stress reduction factor was determined for the stiffened panels. The behavior of both through cracks and part through cracks was studied in the laminated material. The analysis of the data includes fractographic macro observations on the transition from the tensile mode to the shear mode. Observations on delaminations are also presented. An overall conclusion from the detailed results is that the fail-safe properties of the laminated sheet material are significantly superior to those of the solid sheet. Author (ESA)

N77-13163# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
COMPARATIVE IMPACT TESTS ON METAL HONEYCOMB SANDWICH STRUCTURES
J. Koetsier 8 Jan. 1975 12 p
(FOK-R-1843) Avail: NTIS HC A02/MF A01

Impact test results were carried out on metal honeycomb sandwich structures to compare the present structure (i.e. aileron trailing edges of 0.3 mm, 5.322/9 faces and honeycomb 5.453/2, bonded with FM 123-5) to structures with heavier faces and honeycomb. Impact tests on metal honeycomb sandwich structures show that application of heavier honeycomb will result in noticeable improvement of the impact resistance of the actual structures of the A300B airbus. Heavier faces will result in a proportionally lower improvement. Author (ESA)

N77-13164# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
INVESTIGATION INTO THE QUALITY OF A PLASTIC FAIRING AFTER 5 YEARS CONTINUOUSLY BEING EXPOSED TO NATURAL WEATHERING
L. M. Godfried 13 Mar. 1975 5 p
(FOK-R-1860) Avail: NTIS HC A02/MF A01

After outdoor weathering the rear cargo door fairing of the F-28 Fellowship was examined to determine corrosion effects of the unprotected aluminum core in the glass fiber reinforced plastic sandwiches. It was found that the honeycomb acc. 5.453/1 of approximately 30 % of the test specimens showed intercrystalline corrosion; however, the corrected flatwise tensile strength does still meet the requirements of 50 kgf/sq cm. Results obtained so far, after 5 yr outdoor weathering, do not contribute to the possibility of the existence of serious corrosion on non-protected A1-5056 honeycomb in carbon reinforced plastic sandwich constructions. Author (ESA)

N77-13165# European Space Agency, Paris (France).
DEVELOPMENT AND APPLICATION POSSIBILITIES OF NEW CONSTRUCTION TECHNIQUES WITH FIBER-REINFORCED MATERIALS
Manfred Flemming Feb. 1976 102 p refs Transl. into ENGLISH from "Entwicklung u. Anwendungsmoeglichkeit von Bauweisen aus faserverstaerkten Werkstoffen", DGLR, Cologne Report DGLR-Paper-74-117, 1974 Original report in GERMAN previously announced as A75-24154 Submitted for publication
(ESA-TT-267; DGLR-Paper-74-117) Avail: NTIS HC A06/MF A01

The use of carbon and boron fiber reinforced materials in future aircraft design is discussed. A new construction method for use in primary structures will succeed only if all technical problems are solved. The many construction possibilities and the limits of fiber technology are described, and weight reductions obtained are illustrated by practical examples. The design and calculation for strength and rigidity superseding that of conventional structures are discussed. The cost effectiveness of the new construction method is considered. ESA

N77-13166# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Materials Engineering.
THE RELATIONSHIPS OF STRUCTURE TO PROPERTIES IN GRAPHITE FIBERS, PART 3
Russell J. Diefendorf and Edward W. Tokarsky Wright-Patterson AFB, Ohio AFML Nov. 1975 144 p refs
(Contract F33615-72-C-1422)
(AD-A024716; AFML-TR-72-133-Pt-3) Avail: NTIS HC A07/MF A01 CSCL 11/2

Three-dimensional structural characterization of a variety of carbon fibers has been completed following determination of the axial and radial structures in the fibers studied. In addition the relation of fiber strength to three-dimensional structure has been developed. Fibers tend to fail in three separate ways depending on their moduli; failure mode changes from brittle fracture to fibril decoupling to plastic deformation as modulus increases. Strength in Orlon and Rayon base fibers follows the Griffith relation. Strength in Orlon and Courtelle base fibers above the maxima in the strength-modulus curve is controlled by flaws

resulting from cool-down residual stresses as well as surface crystallization. GRA

N77-13167# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Materials Engineering.
THE RELATIONSHIPS OF STRUCTURE TO PROPERTIES IN GRAPHITE FIBERS, PART 4 Technical Report, 1 May 1973 - 31 Apr. 1974
Russell J. Diefendorf, Dennis M. Riggs, and Ian W. Sorensen Wright-Patterson AFB, Ohio AFML Nov. 1975 74 p
(Contract F33615-72-C-1422; AF Proj. 7342)
(AD-A024759; AFML-TR-72-133-Pt-4) Avail: NTIS HC A04/MF A01 CSCL 11/4

The anomalous density dip in PAN precursor carbon fibers has been investigated with respect to properties of commercial fibers and a series of specially heat-treated fibers. The density minimum is apparently due to a combination of two factors: the initial decrease in density caused by weight loss, and the subsequent density increase due to dimensional changes. Modes of failure in Fiber B and Kevlar I, III and IV fibers have been studied. The buckling of these fibers in compression is manifested as oblique strain markings. The strain band directions are used to show that Kevlar I is most ordered and Fiber B, the least. The effect of abrasion on fiber strength has been studied qualitatively; abrasion does not appear to cause drastic reductions in strength. CCA-1 rayon precursor carbon fiber and its replacements have been studied using optical microscopy and differential thermal analysis. The differences amongst the carbon fiber cloths and their precursors are substantial and can be expected to result in performance changes when CCA-1 is replaced by either substitute. The microstructure of pitch-based carbon fibers has been studied using ordinary and polarized light microscopy. Variations in fiber shape and optical activity are related to the presence of both isotropic and mosophitic portions in the precursor pitch. Author (GRA)

N77-13168# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio.
FIBERGLASS REINFORCED PLASTIC BI-PAC VIBRATION AND ROUGH HANDLING TESTS
Richard T. Gibbons 30 Dec. 1975 31 p
(AD-A025783; DSPD-77-75) Avail: NTIS HC A03/MF A01 CSCL 13/4

The development of a container to transport and store two auxiliary fuel tanks was initiated because the tanks are being used in pairs, logistics of tank movement are simplified and ease of deployment is increased. The BI-PAC, developed by Plastics Research Corporation, is capable of holding two F-4 six hundred gallon auxiliary fuel tanks in a side by side configuration. Vibration and rough handling tests conducted at the Air Force Packaging Evaluation Agency (AFPEA) have shown this container to be capable of withstanding simulated environmental hazards. Air Force Packaging Evaluation Agency Project no. 75-P7-29 was undertaken to support ASD/4950/LGT in performing vibration and rough handling tests on a fiberglass reinforced plastic container capable of transporting and storing two 600 gallon F-4 auxiliary fuel tanks. GRA

N77-13169# Naval Civil Engineering Lab., Port Hueneme, Calif.
ENGINEERING PROPERTIES OF EPOXY RESIN AS A STRUCTURAL ADHESIVE FOR CRACKED REINFORCED CONCRETE WATERFRONT FACILITIES Final Report, Jun. - Nov. 1975
William R. Lorman Apr. 1976 69 p refs
(YF53534001)
(AD-A025400; CEL-TN-1429) Avail: NTIS HC A04/MF A01 CSCL 11/1

The assessment of information in the technical literature pertaining to the engineering properties of epoxy resin, as an adhesive material for injection under pressure into cracks in USN reinforced concrete waterfront facilities as a means of restoring structural integrity, covers the period from 1950 to 1975. The review reveals that the available engineering data suffice for establishing a practical guide for civil engineers concerned with such application of epoxy resin. The report condenses a multitude of facts, quantifies the range of values relative to the physical characteristics of hardened epoxy resin, outlines the essentials of approaching a structural bonding problem, and briefly describes the procedure for consolidating a cracked concrete structural member by pressurized injection of epoxy resin. The report pertains to crack repairs that are essential for the stability of concrete waterfront structures; it is not intended to deal with sealing cracks and joints either against penetration of foreign matter or to prevent leakage. Author (GRA)

N77-13170# Massachusetts Inst. of Tech., Cambridge. Fluid Dynamics Research Lab.
ACTIVATION STUDIES IN THE OXIDATION OF GRAPHITE
Robert B. Doak Sep. 1975 112 p refs
(Contract F44620-75-C-0040; AF Proj. 9781; MIT Proj. OSP-82450)
(AD-A026414; AFOSR-76-0690TR; Rept-75-1) Avail: NTIS HC A06/MF A01 CSCL 07/4

One aspect of the oxidation of isotropic graphite has been studied using molecular beam - mass spectroscopy techniques. The measurements considered the hysteresis behavior in CO reaction probability which results upon cycling the surface temperature from 900 K to 1700 K back. A room temperature effusive O2 beam was employed with intensities at the graphite surface varying from 6.8x10 to the 14th power to 2.7x10 to the 15th power molecules/sq. cm. sec. The beam impinged at an angle of 45 degrees relative to the surface normal. Reaction measurements were made in the principle plane normal to the graphite surface. A tuning fork chopper was utilized to modulate species desorbing from the surface and the signal was extracted using a digital phase sensitive detection scheme. The major findings are summarized below: (1) The hysteresis behavior in CO reaction probability is a manifestation of surface adjustment times which are long compared to usual periods of data taking. (2) If brought to 1400K on the lower level of the hysteresis curve, the surface will adjust to a higher (equilibrium) value of reaction probability (corresponding to the upper hysteresis level) provided sufficient time of exposure to an incident O2 beam is allotted. (3) The pertinent quantity in the activation adjustment process is the cumulative number of oxygen particles impinging upon the target surface. Activation did not occur in the absence of an incident O2 beam. (4) A cumulative impingement of 2x10 to the 20th power O2 molecules/sq. cm was necessary to fully activate the surface. This corresponds to the removal of 3x10 to the 17th power carbon atoms/sq.cm. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N77-13171 Clarkson Coll. of Technology, Potsdam, N.Y.
STABILITY OF MIXED COLLOIDAL DISPERSIONS Ph.D. Thesis
Alan Bleier 1976 294 p
Avail: Univ. Microfilms Order No. 76-24747

The effects of the pH, the valence and concentration of the counterions, the complexation (i.e., hydrolysis) of ionic solute species, and in some instances, the relative sol concentrations have been examined by light scattering methods and microelectrophoresis. Various analytical techniques, e.g., atomic absorption and electron microscopy, have been used to investigate some aspects of the mixed dispersions. It has been found that a negatively charged Ludox HS silica can stabilize a negatively charged PVC latex and a (negative) hydrous chromium oxide under conditions for which these sols are normally coagulated (i.e., high counterion concentration or low surface potential). Under specific conditions, however, the hydrophilic silica can be destabilized selectively in the presence of the hydrophobic latex. Dissert. Abstr.

N77-13172 California Univ., Los Angeles.
EXCESS VOLUMES AND CONCENTRATION GRADIENTS

IN THE CRITICAL REGION OF BINARY FLUID MIXTURES Ph.D. Thesis
Thomas Erwin Block 1976 165 p
Avail: Univ. Microfilms Order No. 76-25178

Excess volumes of perfluoro normal hexane plus normal hexane and excess volumes of nitroethane plus 3 methylpentane binary systems were analyzed to extract a form for the scaled equation of state in terms of the pressure derivate of the nonbinary system equation. The use of a scaled equation of state required the experimentally determined exponent beta and coefficient B describing coexistence curve behavior, which may be affected by any concentration gradients present. The growth of gravity-induced concentration gradients was studied with a mathematical model of a binary system, which employs the parametric equation of state to solve flux equations in the vicinity of the critical point. Computer calculated concentration profiles, which show that initial gradients form by sedimentation, were compared with experimentally measured profiles and found to agree qualitatively. Analysis of the effect of the gradients on the measurement of coexistence curves for binary mixtures showed that the effects due to gravity may influence careful experiments in critical mixtures. Dissert. Abstr.

N77-13173 National Lending Library for Science and Technology, Boston Spa (England).
FORMATION OF THE INITIAL REGION IN A TURBULENT DIFFUSE FLAME
A. I. Shchelokov, V. T. Kiriltsev, and S. D. Shein 1976 13 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii (Moscow), no. 2, 1976 p 158-162
(NLL-M-25396-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

A physical model of the formation of the initial region of a turbulent diffuse flame was built up. By deducing an expression, equations were written for the retention of amount of movement, a law for the retention of mass, and a thermal balance equation. Analysis provided an expression for LO/DO. Experiments conducted for Reynolds numbers of 13,000 to 15,100, for a convergent conical nozzle, showed that the results of the experiments agreed well with those of the calculation. Author

N77-13174 British Library Lending Div., Boston Spa (England).
THERMAL DECOMPOSITION AND STRUCTURE OF MAGNESIUM, ZINC AND CADMIUM PEROXIDES
V. A. Lupenck-burmakina and V. Z. Kuprii 23 Sep. 1975 6 p refs Transl. into ENGLISH from Zh. Neorgan. Khim. (Moscow), no. 9, 1971 p 2331-2334
(BLL-Trans-916-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.

The thermal decomposition of magnesium, zinc, and cadmium oxides was investigated with the aid of the isotopic method. It is shown that when magnesium peroxide is heated it decomposes with breaking the peroxide bond, while in the case of zinc and cadmium 50% of the O-O bonds are preserved in the liberated oxygen. On the basis of the results obtained and also of an analysis of PMR spectra and an investigation with the aid of the EPR method of the low-temperature photolysis of polycrystalline samples formulas are proposed characterizing the structure of these compounds. Author

N77-13175 Kent State Univ., Ohio.
THE TRANSPORT OF SELECTED INORGANIC GASES THROUGH ACTIVATED CARBON Ph.D. Thesis
Khin Maung Yin 1976 272 p
Avail: Univ. Microfilms Order No. 76-25380

The time-dependent transport of a small concentration in parts-per-million (ppm) range of an inorganic gas in helium through activated carbon at various temperatures was studied for the following gases: nitrous oxide (N2O), carbon monoxide (CO), carbon dioxide (CO2), and nitric oxide (NO). The transport apparatus consisted of a flow system and a gas chromatograph. Measured for each gas is the time-dependent transmission through a packed bed, which is the ratio of the concentration of the gas at the outlet of the bed to that at the inlet. For N2O, CO, and CO2, the data are well represented by the theoretical transmission function of the Madey-Pflumm dispersion model of fluid transport through porous media. Deduced from the model for each of these three gases are the values and uncertainties of the volume adsorption capacity and the effective dispersivity for the adsorbent-adsorbate system. The transmission data for NO indicates that nitric oxide reacts with activated carbon at 0 C. Dissert. Abstr.

N77-13176 Miami Univ., Coral Gables, Fla.
APPARENT MOLAL HEAT CAPACITIES AND APPARENT MOLAL VOLUMES OF ELECTROLYTES IN ANHYDROUS METHANOL AT VARIOUS TEMPERATURES Ph.D. Thesis
Andrew J. Pasztor, Jr. 1976 227 p
Avail: Univ. Microfilms Order No. 76-24901

A flow type microcalorimeter was used to measure the specific heats of solutions of electrolytes in anhydrous methanol. Apparent molal heat capacities were calculated from the measured specific heats. Densities of methanol solutions were also measured using a vibrating tube densimeter and a magnetic float densimeter, and apparent molal volumes calculated. The apparent molal volumes were extrapolated to infinite dilution, and were found to obey an extended form of the Debye-Huckel law. Apparent molal heat capacities were also extrapolated to infinite dilution and were found to obey a more complex form of an extended Debye-Huckel equation. An attempt was made to divide apparent molal heat capacities and apparent molal volumes into ionic components. The results were interpreted in terms of theories of electrostriction and hydrogen bonding. Dissert. Abstr.

N77-13177 California Univ., Berkeley.
OXYGEN-17 NUCLEAR MAGNETIC RESONANCE STUDIES OF THE SECOND COORDINATION SPHERE OF CHROMIUM(III) IN AQUEOUS SOLUTION Ph.D. Thesis
William Lee Earl 1975 94 p
Avail: Univ. Microfilms Order No. 76-26233

The oxygen 17 bulk water relaxation times and chemical shifts were measured at 8 MHz on several aqueous solutions of chromic oxide and chromic fluoride. Analysis of the NMR data yielded the average lifetime of water molecules in the second coordination sphere. The data were analyzed to yield the relative contributions of each NMR relaxation mechanism to the overall relaxation. The average lifetime of water molecules in the second coordination sphere of Cr 3 is calculated at 298 K to be 1.0x10 to the 10th power sec. The average lifetime for water molecules in the second coordination sphere of chronmic fluoride is not greatly different from the lifetime of water in the second coordination sphere of chromic oxide. Dissert. Abstr.

N77-13178 Virginia Univ., Charlottesville.
ELEMENTAL ANALYSIS OF COMPLEX MATRICES USING CHARGED PARTICLE ACTIVATION Ph.D. Thesis
Patrick J. Clark 1976 402 p
Avail: Univ. Microfilms Order No. 76-25001

Charged particles ranging in energy from 0.3 to 4.5 MeV were used to induce nuclear resonance reactions, Coulomb excitation, and X-ray emission in both thick and thin targets. The sample target matrix varied from a single element to complex geological and biological matrices. Nuclear reactions induced by protons below 5 MeV were investigated for the elements lithium through calcium in order to determine the conditions necessary to achieve the greatest sensitivity and avoid interfering reactions. In addition to bulk elemental analysis, nuclear resonance reactions are also applicable to depth and spatial distribution studies of the sample. Both the comparator method and the internal standard technique were used for quantitative analysis. USGS igneous rocks were used as standards in the comparator method in order to determine major, minor and trace element concentrations in meteorites. The geochemical significance of the fluorine concentrations in the meteorites was postulated. Dissert. Abstr.

N77-13179 Loma Linda Univ., Calif.
COMPUTER ASSISTED ELECTRON SPIN RESONANCE SPECTRAL ANALYSIS OF TRAPPED RADICALS Ph.D. Thesis
Philip Mook-Wah Law 1976 74 p
Avail: Univ. Microfilms Order No. 76-24290

A set of general purpose FORTRAN IV programs were written to assist in the analysis of complex spectra. Some procedures carried out are inversion, coordinates scaling, smoothing, differentiation and integration, correction for slanting baseline,

addition and subtraction, and spectral simulation. As an application, the programs are used to assist in the study of free radicals in gamma-irradiated single crystals of 1,2,3-benzene tricarboxylic acid dihydrate by electron spin resonance spectroscopy. It is found that the predominant free radical formed by gamma-irradiation of the acid crystals at room temperature, is a cyclohexadienyl-type free radical formed by the addition of a hydrogen at the C4 or C6 position. Principal hyperfine coupling constants and isotropic hyperfine coupling constants are found for the C5 proton and for the two methylene protons.
Dissert. Abstr.

N77-13180 Princeton Univ., N.J.
NEW ANALYTICAL TECHNIQUE FOR THE STUDY OF THERMAL DEGRADATION OF STYRENES Ph.D. Thesis
Hong-Hsiang Kuo 1976 213 p
Avail: Univ. Microfilms Order No. 76-23862

Techniques are described which follow the degradation products of series of polystyrenes as they are heated under controlled conditions. The programmable pyrolyzer/mass chromatography and programmable pyrolyzer/gas chromatography/on-the-fly vapor phase infrared/computer methods feature the precise control of temperature and atmosphere to perform pyrolytic analysis, therefore reducing the production of secondary products and providing simple and reproducible chromatogram and infrared spectra. The infrared spectra is corrected for baseline deviation and the signal/noise ratio improved by a computer. Both qualitative and quantitative information on the various components in the sample are obtained. In favorable cases, polymer microstructures are elucidated. Dissert. Abstr.

N77-13181# National Aviation Facilities Experimental Center, Atlantic City, N.J.
PHOTOGRAPHIC INVESTIGATION OF MODIFIED FUEL BREAKUP AND IGNITION Final Report, Jan. 1973 - Dec. 1975
Samuel V. Zinn, Jr., Thor I. Eklund, and William E. Neese Sep. 1976 32 p refs
(AD-A030053/3; FAA-NA-76-10; FAA-RD-76-109) Avail: NTIS HC A03/MF A01 CSCL 21/4

Laboratory evaluations were performed to determine the flammability characteristics, physical properties, and rheological profiles of modified fuel sprays. Photographs were made of fuel particles formed by air shearing in the NAFEC Fire Test Facility. Ignition studies of the modified fuel sprays included photographs of typical combustion patterns. Comparisons of shear viscosity, droplet geometries, and ignitability of the different antimisting fuels clarify the effect of polymeric additives on turbine fuel safety, and indicate critical criteria for modified fuel specifications. The results of this investigation lead to two major conclusions. First, the modified fuel spray consists of particles of large size and highly aspherical geometry. Second, although a modified fuel can be flammable in the presence of an intense ignition source, all modified fuels tested were more difficult to ignite than neat fuel. Author

N77-13182# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
INVESTIGATIONS OF ELEMENTARY REACTIONS IN THE GAS PHASE IN THE H-O-Cl SYSTEM WITH THE ELECTRON SPIN RESONANCE O+HCl AND OH+HCl [UNTERSUCHUNGEN VON ELEMENTARREAKTIONEN IN DER GASPHASE IM H-O-Cl-SYSTEM MIT DER ELEKTRONENSPINRESONANZ O+HCl UND OH+HCl]
W. Hack, G. Mex, and H. G. Wagner Feb. 1976 41 p refs In GERMAN; ENGLISH summary
(Rept-3/1976) Avail: NTIS HC A03/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 11,55

With a view to quantifying catalytic atmospheric ozone decomposition, the reactions of hydrochloric acid with oxygen atoms and hydroxyl radicals O + HCl yields OH + Cl (1) and OH + HCl yields H2O + Cl (2) were studied in an isothermal discharge flow system. The atom and radical concentrations were measured using the electron spin resonance technique. The rate constant (1) was determined from the oxygen atom consumption and independently from the chlorine atom production. The heterogeneous contribution in the reaction system (1) was determined. Author (ESA)

N77-13183# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
RATE CONSTANT MEASUREMENT OF THE REACTION OF HYDROGEN ATOMS AND HYDROXYL RADICALS WITH CARBON SUBOXIDE IN THE TEMPERATURE RANGE 295 K TO 480 K [MESSUNG DER GESCHWINDIGKEITSKONSTANTEN DER REAKTION VON WASSERSTOFFATOMEN UND HYDROXYLRADIKALEN MIT KOHLENSUBOXID IM TEMPERATURBEREICH VON 295 BIS 480 K]
W. Hack, C. Pilz, and H. G. Wagner Apr. 1976 30 p refs In GERMAN; ENGLISH summary
(Rept-6/1976) Avail: NTIS HC A03/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 9,75

The rate constants for the reaction of carbon suboxide with hydrogen atoms H + C3O2 and hydroxyl radicals OH + C3O2 were determined in an isothermal discharge flow system in the temperature range between 295 and 480 K at pressures between 2 and 4 torr. The H-atoms and OH radicals were monitored by the electron spin resonance technique. ESA

N77-13184# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
MATHEMATICAL THEORY OF LAMINAR COMBUSTION. 1: GOVERNING EQUATIONS
G. S. S. Ludford Apr. 1976 27 p refs
(Grant DAAG29-76-C-0026)
(AD-A026974; ARO-12373.20-M; TR-77) Avail: NTIS HC A03/MF A01 CSCL 21/2

The present series of Technical Reports will give a connected account of laminar combustion from the viewpoint of activation-energy asymptotics. The present report derives the governing equations on the basis of continuum mechanics, explaining the combustion approximation and various other simplifying assumptions as well as outlining the asymptotics. Author (GRA)

N77-13185# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
MATHEMATICAL THEORY OF LAMINAR COMBUSTION. 2: THE PREMIXED PLANE FLAME
G. S. S. Ludford May 1976 28 p refs
(Grant DAAG29-76-C-0026; ARO Proj. 12373-M)
(AD-A026763; ARO-12373.21-M; TR-80) Avail: NTIS HC A03/MF A01 CSCL 21/2

The report is concerned with the basic problem of combustion theory: to describe the unlimited one-dimensional steady solution of the governing equations, analogous to the shock wave of ordinary compression flow. Unlike the latter, however, the problem is ill-posed and (as shall be shown in a later report) not applicable in more dimensions. The analysis concentrates on the premixed flame, for which the composition is specified upstream. GRA

N77-13186# California Univ., Irvine. Dept. of Chemistry.
A STUDY OF NITROGEN DIOXIDE 22B2 PHOTODECOMPOSITION TO O1D AND NO2PI IN ITS SECOND PERDISSOCIATION REGION 2500 YIELD 2139 A Interim Report, 1 Apr. 1976 - 31 Mar. 1977
William M. Uselman and Edward K. C. Lee 10 Jul. 1976 31 p refs
(Contract N00014-75-C-0813; NR Proj. 014-506)
(AD-A026876; B-4) Avail: NTIS HC A03/MF A01 CSCL 07/5

A photochemical decomposition study of NO2 (22B2) from specified vibronic states is reported. Below 2440 A, the O(1D) atom quantum yield is 0.5 + or - 0.1, and the asymmetric stretch vibration (NU3) is considered important in the O(1D) formation. Author (GRA)

N77-13187# Ballistic Research Labs., Aberdeen Proving Ground, Md.
ION-MOLECULE ASSOCIATION REACTIONS INVOLVING NO(+) AND H2S, SO2, COS, SF6, N2O, CO, OR Xe
John A. Vanderhoff, Martin S. Miller, and Joseph M. Heimerl May 1976 37 p refs
(DA Proj. 1T1-61102-B-53A; DNA Proj. NWED-QAXHD010)
(AD-A026532; BRL-1886) Avail: NTIS HC A03/MF A01 CSCL 07/5

Quantitative measurements have been made of the three-body association rate coefficients for the clustering of hydrogen sulfide,

sulfur dioxide, carbonyl sulfide, sulfur hexafluoride, nitrous oxide, carbon monoxide, and xenon to the positive nitric oxide ion at 296 K. Selective photoionization of nitric oxide in nitric oxide-hydrogen sulfide, and nitric oxide-sulfur dioxide gas mixtures resulted in the formation of a family of cluster ions. Ion mass spectra are given and interpreted for these two gas mixtures. Rearrangement reactions occur in the nitric oxide-hydrogen sulfide gas mixture to produce protonated hydrogen sulfide positive ions and protonated ammonia positive ions. No rearrangement reactions were observed in the nitric oxide-sulfur dioxide mixture. GRA

N77-13188# Catholic Univ. of America, Washington, D.C. Dept. of Chemistry.
CHEMICAL KINETICS OF SOME ELEMENTARY REACTIONS OF OXYGEN ATOMS Final Report, 1 Jun. 1972 - 29 Feb. 1976
Richard B. Timmons Jun. 1976 16 p refs
(Grant AF-AFOSR-2378-72; AF Proj. 9538)
(AD-A027649; AFOSR-76-0832TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The research studies involved the investigation of the kinetics and mechanism of selected gas phase reactions of ground state oxygen atoms. All of the reactions studied are of either direct or indirect interest with respect to oxidative processes which occur in the atmosphere. Each reaction was studied over wide temperature ranges using fast flow apparatus coupled with electron spin resonance and/or mass spectrometric detection methods. In some cases, (with CH3CN and CF3CN) it was necessary to use the flash photolysis-resonance fluorescence method in order to avoid the problem of free radial chain reactions observed under typical flow tube conditions. The specific rate constants obtained are expressed in terms of the usual Arrhenius equation. The specific applications of these results to environmental chemistry are discussed in this report. GRA

N77-13189# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
A COMPUTER PROGRAM FOR CALCULATION OF POTENTIAL-pH DIAGRAMS OF METAL-ION-WATER SYSTEMS
M. N. Froning and E. D. Verink, Jr. 1976 103 p refs
(Contract N00014-68-A-0173-0015)
(AD-A027634) Avail: NTIS HC A06/MF A01 CSCL 07/4

A computer program has been developed for calculating potential-pH diagrams for Metal-Ion-Water systems. This report represents a description and documentation of the program for use by those who desire to use and further expand the program's versatility. The report includes a brief description of the program and its capabilities along with two diagrams calculated by computer, a detailed description of the procedure and format for entering data, and a description of the procedure involved in determining areas of predominance on the final diagram. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N77-13190 National Lending Library for Science and Technology, Boston Spa (England).
ELIMINATION OF DEFECTS IN THE BASE METAL UNDER THE CLADDING LAYER IN TWO-LAYER STEEL
V. A. Malyshev, E. V. Shevbunov, V. G. Qvsyannikov, A. A. Tokarenko, and A. M. Popovichenko [1975] 10 p refs Transl. into ENGLISH from Stal (Moscow), no. 11, 1975 p 994-995 In ENGLISH and RUSSIAN
(NLL-M-25331-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

An examination of two-layer sheets with a base layer of type 12Kh2N4FA steel and a coating of the corrosion-resistant steel OKh18N10T, manufactured from 7 ton ingots, revealed the so called cord defects - discontinuities in the base metal under the cladding layer, issuing on the connecting boundary of the layers. The formation mechanism of such defects is considered and measures for eliminating them are proposed. An increase in the residual liquid thickness of the two-layer ingot from 50 to 90 to 110 mm completely removes defects of this type, and as a result repairs to the two-layer ingots are reduced almost tenfold. Author

N77-13191 British Library Lending Div., Boston Spa (England).
METAL PHYSICS. DISCRETE CHANGE IN THE STRUCTURE OF MOLTEN ALLOYS FORMED OF COMPONENTS WITH NON-COINCIDENT PACKING
E. S. Filippov 1976 20 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 3, 1976 p 125-132
(BLL-M-25429-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The density of molten In-Sn system alloys and the densities of molten indium and tin have been measured by the flattened droplet method at temperatures between melting point and 1500 C. It has been found that density varies in a staged manner according to temperature. It was established, on the basis of equality of the ratio of the temperatures of neighboring structural transitions (stages) to the coefficient of packing of atoms in groupings, that the groupings of molten indium are packed in a face centered cubic pattern and those of molten tin in a mixture of body centered cubic and simple cubic packings. The effects of additives with directional and nondirectional bonds on the structure of the base of a molten alloy have been established. Structural additivity has been noted in the range of compositions approaching eutectic: the groupings are packed in simple cubic, body centered cubic and face centered cubic patterns, i.e. the molten eutectic is formed of groupings of components which do not have mutual effects on the structure of the groupings. Author

N77-13192 British Library Lending Div., Boston Spa (England).
METALLOGRAPHY AND THE HEAT TREATMENT OF METALS
E. I. Mogilevskii and G. S. Vershinskaya 1976 15 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii (Moscow), no.3, 1976 p 159-164
(BLL-M-25432-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The mechanism was researched by which a protective coating forms when VT3-1 alloy reacts with the atmosphere in a flame furnace, enriched with LI2O3. Lithium oxide was used as the protective coating in the high-temperature oxidation of titanium. VT3-1 alloy scale was investigated; one of the phases adjacent to the metal-oxide boundary was classified as rutile, the other as lithium titanate, which is also responsible for the oxidation process. The coefficient of consumption of air with which lithium titanate forms was determined, and the mechanism by which it forms was clarified. It was proven that lithium titanate reduces oxidation, also the depth of the layer saturated with gases, by 50-67%. Author

N77-13193 British Library Lending Div., Boston Spa (England).
CALCULATING THE THERMODYNAMIC PARTICULARS OF MOLTEN ALLOYS OF 3D-TRANSITIONAL METALS AND GERMANIUM
P. V. Kocherov, M. S. Petrushevskii, and P. V. Geld 1976 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 4, 1976 p 9-12
(BLL-M-25450-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The enthalpy of formation of molten alloys of germanium with iron, cobalt and nickel, and their excess Gibbs energies, have been calculated using the quasi-chemical theory and the surrounded atom theory. The results obtained indicate a considerable deviation from the law of Raoult, agree satisfactorily with experimental data, and indicate an asymmetrical relationship of the thermodynamic particulars to concentration. Author

N77-13194 British Library Lending Div., Boston Spa (England).
DEFORMATION RESTORATION OF DISLOCATION INTERNAL FRICTION IN A HIGH-PURITY ALUMINIUM
M. A. Krishtal, B. E. Pestov, and L. R. Shelestov 1976 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 4, 1976 p 124-126
(BLL-M-25452-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Measurements made after deformation restoration of the dislocation internal friction in a polycrystalline high-purity aluminum are presented. The results were processed using the Granato-Hikata-Lucke theory. Two restoration stages with activation energies of 0.26 and 0.35 eV were observed. Author

N77-13195 British Library Lending Div., Boston Spa (England).
PRESSURE TREATMENT OF METALS: DETERMINING THE LIKELIHOOD OF METAL FRACTURING DURING HOT EXTRUSION
B. M. Gotlib and I. A. Dobychin 1976 15 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 3, 1976 p 118-122
(BLL-M-25427-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

A solution is reported for the statistical marginal problem of determining the statistical characteristics of random stress and strain fields during the axisymmetrical hot extrusion of bars of alloys with low ductility. The random nature element is introduced by the random mechanical properties of the medium. The results of solving the statistical marginal problem are used for determining the likelihood of metal fracturing during extrusion. Author

N77-13196 North Texas State Univ., Denton.
SPECTROSCOPIC INVESTIGATION OF SOME ALLYL ALKALI METAL COMPOUNDS Ph.D. Thesis
Michael Lee Moore 1976 156 p
Avail: Univ. Microfilms Order No. 76-23771

To gain better understanding of the nature of the carbon-metal bonding in 3 neopentylallyl alkali metal systems, an investigation was extended to 3-neopentylallylpotassium. In addition, pertinent data on the 3-neopentylallyl systems are examined in an attempt to understand the trends in the bonding habits, as affected by the solvent, the cation and the temperature. The proton magnetic resonance spectrum of 3-neopentylallylpotassium in tetrahydrofuran- d8 indicates that the compound exists as cis and trans isomers in dynamic equilibrium, with the cis isomer predominating. A more substantial degree of ionic delocalization is indicated for 3-neopentylallylpotassium than for either the lithium or sodium derivatives. The temperature dependent spectrum is best explained by a barrier to rotation about the C alpha-C beta bond, as a result of ionic delocalization. Dissert. Abstr.

N77-13197 Illinois Univ., Urbana-Champaign.
THERMODYNAMIC AND SPECTROSCOPIC STUDIES OF REACTIVITY AND BONDING IN TRANSITION METAL LEWIS ACID-BASE SYSTEMS Ph.D. Thesis
Marinda Pasadena Li 1976 174 p
Avail: Univ. Microfilms Order No. 76-24127

As an initial approach to understanding the behavior of certain organometallic systems in catalysis, the Lewis acidity of some first row and second row transition metal systems was quantitatively characterized. As yet, the quantitative effects of introducing a second metal complex into the coordination sphere of a first metal center remain relatively unexplored. Analogous bridge-splitting reactions have been observed for a variety of Lewis bases (nitrogen, sulfur, and oxygen donors) reacting with the chloro-bridged dimers, (Rh(1.5-cyclooctadiene)Cl)2, [Rh(CO), 2Cl]2, and [P(pi-methylallyl)Cl]2. Dissert. Abstr.

N77-13198 Wisconsin Univ., Madison.
STEREOCHEMISTRY OF NICKEL AND PLATINUM CARBONYL CLUSTERS Ph.D. Thesis
Loren Dale Lower 1976 234 p
Avail: Univ. Microfilms Order No. 76-18893

A single crystal X-ray diffraction study on ((Ph3P)2N)2(-) (Ni5 (CO)9(mu2-CO)3) has shown the geometry of the dianion to be based on a trigonal bipyramidal array of nickel atoms. The anion's structure may be thought of as arising from the coordination of a cyclopropenyl-like (Ni3(CO)3(mu-CO)3)2(-) fragment to two apical Ni(CO)3 groups, each of which functions effectively as a Lewis acid. The bis(triphenylphosphine)-iminium cation was shown to have a (C sub s)-m geometry, as opposed to the customary C2-2 one. An X-ray diffraction study on (Ph4As)2(Ni3(CO)3(mu2--CO)3)3 has indicated the dianion to be formed from the fusion of three parallel Ni3(CO)3(mu2-CO)3 units via direct Ni-Ni interactions. Dissert. Abstr.

N77-13199 Illinois Univ., Urbana.
CORROSION AND STRESS-CORROSION CRACKING OF ALPHA-PHASE COPPER-ZINC ALLOYS IN AQUEOUS AMMONIA Ph.D. Thesis
Bo-Ching Cheng 1976 155 p
Avail: Univ. Microfilms Order No. 76-24057

It was shown that rapid anodic dissolution or tarnishing can occur in this system, depending on the condition of the solutions. In non-tarnishing solutions, dissolution was found to be under concentration polarization. The onset of tarnishing was found to require a critical partial anodic current density for copper, which was shown to provide sufficient cuprous ions at the surface to exceed the stability constant for Cu2O, the major constituent of the tarnish. It is shown that the onset of tarnishing can also be predicted using the Pourbaix diagram, if surface concentrations of ionic species are used for constructing the equilibrium boundaries in the diagram. Stess corrosion tests were carried out on pure copper in tarnishing solutions. It was found that pure copper was immune to SCC in constant load tests but became susceptible to intergranular cracking in slow strain rate tests. Dissert. Abstr.

N77-13200 Wayne State Univ., Detroit, Mich.
EFFECT OF PRIOR HYDROSTATIC PRESSURE ON PLASTIC DEFORMATION IN NIOBIUM AND MOLYBDENUM Ph.D. Thesis
Dibyajyoti Aichbhaumik 1976 149 p
Avail: Univ. Microfilms Order No. 76-26103

Annealed niobium and molybdenum specimens were pressurized in the range 0-15 kbar at room temperature. The pressurized samples were then tested in uniaxial compression at atmospheric pressure. In the case of niobium, it is found that beyond a critical pressure of 0.04 kbar the yield stress is progressively reduced with increasing prior pressure at a given temperature. Moreover, the pressure effect increases progressively with decreasing temperature of uniaxial compression testing. In the case of molybdenum, however, no effect is detected in the pressure range 0-15 kbar. The dependence of yield stress on prior pressure is interpreted in terms of dislocation generation at non-spherical second-phase particles in niobium, using the model of Ashby and Johnson. Dissert. Abstr.

N77-13201 Illinois Univ., Urbana.
STRESS CORROSION CRACKING AND GASEOUS HYDROGEN EMBRITTLEMENT OF ALPHA TITANIUM ALLOYS Ph.D. Thesis
Gerhardus Harmannus Koch 1976 169 p
Avail: Univ. Microfilms Order No. 76-24118

The characteristics of stress corrosion cracking and gaseous hydrogen embrittlement in titanium alloys are compared to investigate the possibility that fracture in these environments occurs by similar mechanisms. The studies were carried out on a high purity Ti-8Al alloy and on a commercial Ti-8Al-IV-1Mo alloy, the former being single phase alpha at room temperature while the latter contains approximately 5 pct beta phase. Results indicate that the path of stress corrosion cracking is different from that in gaseous hydrogen embrittlement. It is suggested that hydrogen entry in the gaseous case occurs predominantly via the beta interface, whereas in the aqueous case hydrogen may enter directly into the alpha phase. Dissert. Abstr.

N77-13202 Washington Univ., Seattle.
LOW AMPLITUDE FATIGUE CRACK GROWTH IN COPPER BICRYSTALS Ph.D. Thesis
Dennis William Wiedemeier 1976 135 p
Avail: Univ. Microfilms Order No. 76-25471

Flat isoaxial copper bicrystals were prepared with a (122) tensile axis and a longitudinal grain boundary. A notch was mechanically introduced in crystal A to specify the crack initiation site and decrease the time required for crack initiation. The orientation of crystal A about the tensile axis was kept the same for the different samples. The grain boundary was changed by rotating crystal B various amounts about the tensile axis. The samples were tested with total strain control between limits of + or - 0.001 on an MTS servo-controlled hydraulic fatigue testing machine. Crack growth was monitored with a travelling microscope at a magnification of 150 X. The hysteresis loops were continuously monitored on an oscilloscope with the maximum

and minimum loads periodically recorded. Tests were conducted in both air and purified argon environments. Dissert. Abstr.

N77-13203 Texas Technological Univ., Lubbock.
A STATISTICAL ANALYSIS OF SURFACE FINISH IN FINE TURNING OF STEEL Ph.D. Thesis
R. Meenakshi Sundaram 1976 186 p
Avail: Univ. Microfilms Order No. 76-23909

The resulting surface roughness values obtained in fine turning of AISI 4140 steel were modelled with a view to developing process control charts for controlling the quality of surface roughness. The effect of gradual flank wear on the resulting surface finish was also studied. Mathematical models to predict the surface roughness values were developed for TiC coated tools as well as uncoated tungsten carbide tools. TiC coatings on tungsten carbide tools are given to prolong the tool life and improve the capability of producing better surfaces. For developing the models, a relatively new experimental design called the rotatable design is used. The performance of TiC coated tools in comparison with uncoated tools has been evaluated using statisical techniques. The criteria used for the performance evaluation were the tool flank wear the RMS surface roughness values. Dissert. Abstr.

N77-13204 Cincinnati Univ., Ohio.
A CONSTITUTIVE THEORY FOR METAL CREEP Ph.D. Thesis
James Harvey Laflen 1976 145 p
Avail: Univ. Microfilms Order No. 76-25128

To determine the phenomenological description of a specific material, a series of load rate, strain rate, and creep tests were performed on wrought Udimet 700 at 1,700 F. The analysis of the data showed the quasi-static creep strain rate response was bounded from above and below. The upper bound corresponded to the locus of maximum primary creep rates, and was observed in the higher of the quasi-static load tests. The lower bound was the minimum creep rate, and was observed in the creep tests, strain rate tests, and at the low load rate tests. The concept of transition from one creep rate to another was shown to depend on a material stress rate coordinate which was derived from the concept of a thermally activated process time which was stress dependent. A transmission electron microscope study of the failed surfaces showed that the results were not test type dependent, but could be categorized by stress magnitude which supports the observed phenomenological behavior. Dissert. Abstr.

N77-13205 Utah Univ., Salt Lake City.
FREQUENCY AND HISTORY DEPENDENCE OF INTERNAL FRICTION PEAKING IN COPPER Ph.D. Thesis
Norman Scott Cannon 1976 132 p
Avail: Univ. Microfilms Order No. 76-25844

The Simpson-Sosin dragging model, extended to include an elastic dislocation restoring force, is used for data analysis. This model aided the interpretation of radiation produced double peaking as being the result of a composite of two internal fraction peaks: one peak for the dislocation type characteristic of the old grain structure, and another for the dislocation type characteristic of the new, recrystallized grains. A frequency study using different vibrational modes of the same sample led to the conclusion that the damping coefficient (B) is a frequency-dependent parameter in the 120 Hz to 2,200 Hz frequency range. The radiation produced relative peak height of internal friction was found to increase when the preirradiation anneal temperature of the sample was increased from 400 C to 460 C; then the relative peak height decreased when the anneal temperature was changed from 460 C to 500 C. The relative peak height decreased with increasing sample vibrational frequency. Dissert. Abstr.

N77-13206 Wayne State Univ., Detroit, Mich.
SOLUTION EFFECTS ON NICKEL (II) AND COPPER (II) SOLVENT LIGAND EXCHANGE KINETICS IN ETHANOL-WATER MIXTURES Ph.D. Thesis
Thomas David Fink 1976 221 p
Avail: Univ. Microfilms Order No. 76-26127

The kinetics of the solvated Ni(II) and Cu(II) ions reacting with ammonia was studied using the temperature-jump relaxation method in ethanol-water mixtures ranging from 0% to 90% ethanol (w/w). In order to obtain activation parameters for the Ni(II)-NH3 reaction, this system was studied at 15, 25, and 35 C. In addition to the kinetic studies, the protonation constant of ammonia and the stepwise formation constants of the nickel (II)-ammonia complexes were determined at all solvent compositions and at each of the temperatures encompassed. The Cu(II)-NH3 reaction was studied at 25 C, and the stepwise formation constants of the copper (II)-ammonia complexes were determined at 25 C at all solvent compositions at which kinetic runs were made. Dissert. Abstr.

N77-13207+ Paris Univ. (France). Lab. des Proprietes Mecaniques at Thermodynamiques des Materiaux.
MECHANICAL PROPERTIES OF ULTRAPURE TITANIUM AT TEMPERATURES LOWER THAN 100 C Final Report [ETUDE DES PROPRIETES MECANIQUES DU TITANE TRES PUR A TEMPERATURE INFERIEURE A 100 C]
M. P. Biget and G. Saada Dec. 1975 20 p refs In FRENCH (Contract DGRST-71-7-2784)
Avail: NTIS HC A02

The plastic deformation of ultrapure monocrystalline titanium betwen 4 and 300 K was investigated. Deformation is essentially caused by sliding of dislocations in the prismatic planes. The elastic limit of the samples was found to be lower than the samples studied by others, at all temperatures, which effectively indicates a higher degree of purification. The elastic limit varies strongly with temperature. There are two deformation mechanisms according to temperature. ESA

N77-13208 Ecole Superieure de Chimie, Toulouse (France). Lab. de Metallurgie.
IDENTIFICATION, RESTORATION AND GROWTH KINETICS OF TITANIUM ALLOY PASSIVATION LAYERS Final Report [IDENTIFICATION ET CINETIQUE DE CROISSANCE ET DE RESTAURATION DE LA COUCHE DE PASSIVATION DES ALLIAGES DE TITANE]
J. A. Petit and F. Dabosi Jul. 1975 58 p refs In FRENCH (Contract DGRST-73-7-1558)
Avail: Issuing Activity

Thin passivation films (thickness less than 100 Angstrom) were investigated on the following materials: T4O, TU2, TA6V, Ti3OMo, Ti0.2Pd, and Ti1.5Ni. Potentiostatic, galvanostatic, and metallographic methods were used to identify the following properties: a logarithmic growth law inverse to thickness as a function of time in neutral medium (Na2SO4 and NaCl1N), the principal role of passive Ti dissolution in acid media (H2SO4 5N), and good corrosion resistance by pitting these materials in halogen media. A geometric pit growth model is used to demonstrate the morphology and the growth laws observed. ESA

N77-13209*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PHASE DIAGRAMS OF METALLIC SYSTEMS (ALPHABETICAL CUMULATIVE ALLOY SYSTEM INDEX AND TABLE OF CONTENTS)
N. V. Ageev, ed. Washington Dec. 1976 107 p Transl. into ENGLISH from the book "Diagrammy sostoyaniya metallicheskikh sistem", v. 1-19, Moscow, VINITI Press, 1959 - 1976. Selected pages
(NASA-TT-F-17296) Avail: NTIS HC A06/MF A01 CSCL 11F

The compilation of phase diagram information is the most comprehensive publication available on phase diagram information for binary, ternary, and higher order alloy systems. The Tables of Contents in volumes 1 through 17 of compilation do not list the contents by alphabetic chemical symbols, but in Russian. Volumes 18 and 19 have their Tables of Contents listed by alphabetic chemical symbol. It is a laborious task to use this compilation because no cumulative alloy system index is available. This translation provides individual volume listing of contents by page number with alphabetic chemical symbols and it provides a cumulative alloy system index, listing alloys systems alphabetically by chemical symbol. This publication should facilitate the use of this valuable information source. Author

N77-13210# Bofors A. B. (Sweden).
STUDY OF SUPER ALLOYS PRODUCED VIA POWDER

METALLURGY Final Report, Jan. 1973 - Jul. 1975
Lars Hellner and Hans Johansson 1975 56 p refs Sponsored by Swed. Board of Tech. Develop. Prepared jointly with Brown, Boveri & Cie, A.G., Baden, Switz.
Avail: NTIS HC A04/MF A01

Hot workability tests on super alloys produced via powder metallurgy, including the cobalt base alloys X 40, MAR M 509, the nickel base alloy IN 738, and dispersion hardened IN 738, are described. The cobalt base alloy X 40 in the HIP condition showed relatively low ductility in hot workability tests. Although very low deformation rates were tested no signs of super plasticity were found. X 40 in the cast condition also showed low ductility as did X 40 HIP, MAR M 509. HIP X 40 was subjected to heat treatments and stepwise deformation in order to get an improved hot workability, however, none of the treatments had any effective influence. Microscope investigation of the fractured specimens from both HIP and extruded material showed cracks to be mainly interparticular, possibly accounting for the low ductility. It is concluded that the cobalt base alloys, produced from inert-gas atomized powder, could not practically be forged or rolled. Hot workability tests were also performed on the nickel base alloy IN 738 in the HIP and cast conditions. Very low ductilities were obtained, in agreement with literature on another nickel base alloy, IN 100. Extruded IN 738, dispersion hardened with Y2O3, however, showed good ductility. The tensile behavior was not superplastic, as reported for IN 100, but the values indicate that extruded IN 738 + Y2O3 should be well forgeable. Author (ESA)

N77-13211# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
THE EFFECT OF GEOMETRY ON THE FATIGUE STRENGTH OF ALUMINIUM ALLOY LUGS
F. E. Kiddle London Aeron. Res. Council 1976 15 p refs Supersedes RAE-TR-75045; ARC-36216
(ARC-CP-1349; RAE-TR-75045; ARC-36216) Avail: NTIS HC A02/MF A01; HMSO £1; PHI $3.90

Al 2% Cu alloy lug specimens of five different geometries chosen to represent a range of static strength values were fatigue tested under constant amplitude loading at ambient temperature. It is shown that the mode of failure was the same in all lug fatigue tests in contrast to the variable mode of failure expected in static tests. A comparison of the fatigue strengths of the lugs shows some correlation with the net stress concentration factor. Author (ESA)

N77-13212# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Metallab.
DEVELOPMENT OF A HIGH STRENGTH ALUMINUM ALLOY OF THE TYPE AlZnMg, WHICH IS WELDABLE AND INSENSITIVE TO STRESS CORROSION CRACKING Final Report
Ulrich Heubner Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 141 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-35) Avail: NTIS HC A07/MF A01; ZLDI, Munich, DM 29,20

An aluminum alloy with high strength and very low stress corrosion crack (SCR) susceptibility was achieved by addition of manganese and zirconium. The alloy AlZn5,5Mg3,5Mn1,2Zr0,2 (basis Al 99.9) had a 0.2% yield strength of 51 kp/sq mm, an ultimate tensile strength of 57 kp/sq mm, and an SCR threshold greater than or equal to 75 kp/mm to the (3/2) power (3% NaCl, 25 C, crack parallel to the direction of extrusion). Manufacturing of the same alloy on the basis of Al 99.5 also resulted in low SCR susceptibility. Weldability is good. Microstructure and crack surfaces are described. An attempt to produce the alloy by powder metallurgy was made. Experimental results obtained with alloys containing additions of Ti, V, Cr, Mn, or Zr are also presented. Author (ESA)

N77-13213# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
A PSEUDOPOTENTIAL CALCULATION OF THE ALKALI-MERCURY SYSTEMS INCLUDING THE LOWEST P-STATES OF THE ALKALI
Rudolf Dueren Dec. 1975 18 p refs
(Rept-13/1975) Avail: NTIS HC A02/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 6,55

Potentials for the system Na, K, Rb, and Cs interacting with Hg were calculated for several internuclear distances. The calculation is based on the alkali-rare gas interaction, with a major difference in terms of the effective potential for the valence electron. ESA

N77-13214# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
CORROSION OF ALUMINIUM ALLOYS AND JOINTS IN MARINE ATMOSPHERE
A. H. LaCrois 13 May 1975 15 p
(FOK-R-1863) Avail: NTIS HC A02/MF A01

Bonded and riveted panels with various protection systems were exposed to different marine atmospheres for 3 yrs. Sea exposure has a strong corrosive influence on the non-clad materials. Depending on the environment a decrease of the lap shear strength of the 2024 and 7075 chromic acid anodized panels of from 6 to 16 % was observed after an exposure time of 3 yr. The lap shear strength was not influenced after 1 yr exposure as reported previously. The corrosion resistance for clad and anodized materials was fairly good. The use of a corrosion inhibiting adhesive primer offered additional corrosion protection on both materials. Author (ESA)

N77-13215# Illinois Univ., Urbana-Champaign.
PHASE INSTABILITY DURING LOW CYCLE FATIGUE OF STEEL Final Report, 15 Sep. 1972 - 31 Jan. 1976
Carl J. Altstetter 31 Mar. 1976 9 p refs
(Grant DA-ARO(D)-31-124-73-G43)
(AD-A024961; ARO-8101.7-MC) Avail: NTIS HC A02/MF A01 CSCL 11/6

Studies of the relationship between martensitic transformation and low cycle fatigue have been carried out with a variety of related austenitic stainless steels. In addition to using composition as a variable, other effects such as test temperature, heat treatment and loading program were studied. Fatigue life under controlled strain amplitude conditions was determined, while the amount of alpha martensite was continuously monitored. Optical, SEM and TEM metallographic results were used to interpret the mechanical behavior. Some studies on strain aging vs. cyclic deformation of iron and mild steel were also carried out.
Author (GRA)

N77-13216# Army Construction Engineering Research Lab., Champaign, Ill.
INITIAL STUDIES OF IN-SEM FRACTURE USING A TENSILE STAGE Final Report
James Aleszka May 1976 35 p refs
(DA Proj. 4A7-61102-AT-23)
(AD-A025203; CERL-TR-M-181) Avail: NTIS HC A03/MF A01 CSCL 11/6

Using a uniquely designed base, tensile tests were performed on A-36 and HY-130 steel plate specimens and a defective AX-110 weld deposit under vacuum inside a scanning electron microscope. Although the base is also designed to handle compression and bending tests, this initial investigation was confined to tensile loading. Results to date show that considerable plastic deformation occurs within the grains of the A-36 and HY-130 specimens prior to failure. Stringers of inclusions were found to serve as principal sites for crack initiation and void formation. The tensile stage was found to be successful in monitoring crack growth in specimens. Author (GRA)

N77-13966 European Space Agency, Paris (France).
THERMOCHEMICAL DEPOSITS ON TITANIUM ALLOYS
Pierre Lepetit, Andre Hivert et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1971-1 (ESA-TT-351) Nov. 1976 p 60-73 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 37-44 Original report in FRENCH previously announced as A76-28754 (For primary document see N77-13962 04-99)

N77-13969 European Space Agency, Paris (France).
FIRST RESULTS OF THE MICROFRACTOGRAPHIC EXAMINATION OF FAILURE OF A TITANIUM ALLOY AT 450 C UNDER LOW CYCLE FATIGUE CONDITIONS
Georges Vidal, Guy Caruchet, Jean-Louis Bernard et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351)

Nov. 1976 p 97-100 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 59-61 Original report in FRENCH previously announced as A76-28757 (For primary document see N77-13962 04-99)

N77-13973 European Space Agency, Paris (France).
LOW CYCLE FATIGUE AND MICROFRACTOGRAPHY OF FATIGUE RUPTURES OF THREE ALUMINIUM ALLOYS
Georges Vidal, Guy Ramusat et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-2 (ESA-TT-352) Nov. 1976 p 69-98 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. 1976 p 95-107 Original report in FRENCH previously announced as A76-33746 (For primary document see N77-13970 04-99)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N77-13217* National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH TEMPERATURE OXIDATION RESISTANT CERMET COMPOSITIONS Patent
Wayne M. Phillips, inventor (to NASA) (JPL) Issued 9 Nov. 1976 8 p Filed 20 Nov. 1975 Supersedes N76-13293 (14-04, p 0433) Sponsored by NASA
(NASA-Case-NPO-13666-1; US-Patent-3,990,860; US-Patent-Appl-SN-633877; US-Patent-Class-29-182.5) Avail: US Patent Office CSCL 11B

Cermet compositions are designed to provide high temperature resistant refractory coatings on stainless steel or molybdenum substrates. A ceramic mixture of chromium oxide and aluminum oxide form a coating of chromium oxide as an oxidation barrier around the metal particles, to provide oxidation resistance for the metal particles. Author

N77-13218 Akron Univ., Ohio.
NUCLEAR MAGNETIC RESONANCE STUDY OF 1,2-POLYBUTADIENE AND POLYBUTENE-1 AND THE PYROLYSIS BEHAVIOR OF POLY(ALPHA, BETA, BETA-TRIFLUOROSTYRENE-co-METHYL METHACRYLATE Ph.D. Thesis
Joseph Zymonas 1976 176 p
Avail: Univ. Microfilms Order No. 76-24404

High resolution nuclear magnetic resonance spectra of isotactic, syndiotactic, and atactic 1,2-polybutadiene are presented and interpreted. The methylene protons of isotactic 1,2-polybutadiene are nonequivalent, differing in chemical shift by 0.2 ppm, indicating that methylene proton resonance can provide information about the meso dyad content of 1,2-polybutadiene. The chemical shifts of methine type vinyl protons in isotactic and syndiotactic 1,2-polybutadiene differ by 0.14 ppm, indicating that the resonance of such protons can provide information about the relative amounts of isotactic, syndiotactic, and heterotactic triads in 1,2-polybutadiene. The pyrolysis behavior of a series of alpha, beta, beta-trifluorostyrene/methyl methacrylate copolymers was studied by pyrolysis-gas chromatography. Unexpectedly high yields of hybrid monomer indicated that the thermal degradation of copolymers did not occur by a completely random process. Dissert. Abstr.

N77-13219 Akron Univ., Ohio.
MICELLAR SIZE EFFECT IN EMULSION POLYMERIZATION OF STYRENE Ph.D. Thesis
Pao-Chi Wang 1976 173 p
Avail: Univ. Microfilms Order No. 76-24402

The emulsion polymerization of styrene with potassium persulfate as the initiator showed that the rate of polymerization varied with varying values of surfactant ratio. For a given level of a total number of mixed micelles in the system, the mixture with an r value of about 0.2 gave a maximum in the total number of latex particles, a maximum rate of polymerization, and the narrowest particle size distribution. These observations lead to the formation of the hypothesis of the micellar size effect on particle nucleation in the emulsion polymerization process. Experimental results have shown that, other things being equal, the emulsion polymerization kinetics should be expressed by a three-parameter model. Dissert. Abstr.

N77-13220# Massachusetts Univ., Amherst.
STUDIES ON THE ORIENTATION AND DEFORMATION PROPERTIES OF LOW AND HIGH DENSITY POLYETHYLENES Ph.D. Thesis
Dennis George Peiffer 1976 261 p
Avail: Univ. Microfilms Order No. 76-22286

The deformation, orientation and morphology of low and high density polyethylene was investigated. The following general topics were studied: (a) the form birefringence dependence on lamellar morphology and spherulitic deformation; (b) the amount of crystallinity change upon deformation; (c) the effects of molecular weight and molecular weight distribution upon morphology as seen by SALS; (d) experimental studies of amorphous orientation in semi-crystalline polymers that are uniaxially oriented. Comparison with theory is considered. Experimental studies of the orientation and morphology in special textures that are produced by biaxial orientation were also conducted. Dissert. Abstr.

N77-13221 Wayne State Univ., Detroit, Mich.
RECOMBINATION LUMINESCENCE FROM PHOTOIONIZED ORGANIC AND AQUEOUS GLASSES Ph.D. Thesis
Ken Kun Ho 1975 126 p
Avail: Univ. Microfilms Order No. 76-26140

Recombination fluorescence (RF) was produced following the photoionization of a suitable solute in a variety of aqueous and organic matrices at low temperature. Polarized photoselection techniques were applied to study the stimulated RF in MTHF containing TMPD at 77 K. Fractional stimulation with a series of infrared and visible light pulses after the polarized photoionization of the oriented solute molecules gives stimulated polarized RF emission which characterizes the spatial orientation of the cations. It was found that most of the shallow trapped electrons are spatially correlated with their parent cations. However, some of the more deeply trapped electrons are noncorrelated and recombine randomly with the cations in the matrix. Dissert. Abstr.

N77-13222 Stevens Inst. of Tech., Hoboken, N.J.
CHAIN ADDITION POLYMERIZATIONS WITH TEMPERATURE VARIATIONS: A COMPUTER STUDY Ph.D. Thesis
Robert D. Capinpin 1976 277 p
Avail: Univ. Microfilms Order No. 76-25159

The effects of reaction parameters on the thermal behavior and consequently on the properties of chain addition polymers formed in well-mixed batch reactors were analyzed. Two modes of polymerization were studied: conventional mode where the monomer is depleted first before the initiator, and dead-end mode where the initiator is depleted first before the monomer. It was found that thermal runaway broadens the molecular weight distribution in conventional polymerizations whereas it narrows the distribution in strong dead-end polymerizations. A criterion for predicting thermal ignition in chain addition homopolymerizations was derived based on a Semenov type ignition analysis. It was found that ignition is more likely to occur in conventional polymerizations than in dead-end polymerizations. Dissert. Abstr.

N77-13223*# Ultrasystems, Inc., Irvine, Calif.
FLAME RETARDANT POLYPHOSPHAZENES Final Report, Jun. 1974 - Jul. 1976
K. L. Paciorek, D. W. Karle, and R. H. Kratzer Aug. 1976 101 p refs
(Contract NAS3-17829)
(NASA-CR-135090; SN-8262-F) Avail: NTIS HC A06/MF A01 CSCL 11G

Three processes for the preparation of polyphosphazenes were investigated: (1) the reaction of bisphosphines with diazides, (2) the condensation of bisdichlorophosphoranes with diamines; and (3) the treatment of bisphosphines with diamines in the presence of carbon tetrachloride followed by base dehydrohalogenation. All products obtained were of low molecular weight; the degree of polymerization did not exceed twelve repeating units. However, several compositions exhibited good thermal stability.

No weight loss was observed up to 390 C when heated in air at 5 C/min. Treatment of bisphosphines with either an excess of a diazide or an excess of a diamine in the presence of carbon tetrachloride resulted in the production of difunctional phosphazenes which were respectively, azido and amino terminated. The reaction of these azido terminated extended monomers with bisphosphines did not produce high molecular weight materials. The bis-aminophosphazene prepared for the first time under this contract was successfully incorporated into a polyimide. Author

N77-13224# Royal Aircraft Establishment, Farnborough (England).
EFFECT OF TIME AND TEMPERATURE ON A HEAT-RESISTANT NYLON YARN
M. Webb Oct. 1975 25 p refs
(RAE-TR-75113; BR49414) Avail: NTIS HC A02/MF A01

An extra-high tenacity, continuous filament, heat resistant, nylon-66 yarn was heated at 150 and 175 deg for up to two years and certain properties subsequently measured at 20 deg. Tex, breaking strength, tenacity, extension, and mass decreased and the number of carboxyl end groups increased. Author (ESA)

N77-13225# Bristol Univ. (England). Dept. of Aeronautical Engineering.
EXPERIMENTAL DETERMINATION OF MECHANICAL PROPERTIES OF UNIDIRECTIONAL CARBON FIBRE REINFORCED PLASTICS IN COMPRESSION B.S. Thesis
A. R. Walker and D. N. Williams Jun. 1976 66 p refs
(BU-201) Avail: NTIS HC A04/MF A01

An experimental investigation into the mechanical properties of carbon fiber reinforced plastics (CFRP) is described and the results obtained evaluated. Mechanical properties, namely, ultimate compressive stress, Young modulus, Poisson ratio, and the stress-strain relationships, were obtained for both longitudinally and laterally orientated fiber direction test specimens. A triangular aluminum end block and waisted specimen configuration was chosen for all the compression testing and a U-block was incorporated to minimize any bending effects. The stress-strain relationships obtained showed that longitudinally the CFRP exhibited almost linear mechanical properties, but laterally it was distinctly nonlinear. The explosive mode of failure which occurred led to a microscopic examination of the fracture surfaces and optical observation of polished sections. Results confirmed that the resin rich layers between the carbon fiber layers were partly responsible for the bursting mode of failure, which prevented high ultimate compressive stress values being reached.
Author (ESA)

N77-13226# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
SILICONE BRAKE FLUIDS: TWO-YEAR FIELD TEST Final Report
J. H. Conley, Robert Jamison, and Charles B. Jordon Jan. 1976 44 p
(DA Proj. 1T6-62611-AH-69)
(AD-A026180; USAMERDC-2164) Avail: NTIS HC A03/MF A01 CSCL 13/6

A study was conducted to evaluate the performance of silicone brake fluids in military vehicles operating under various climatic conditions. These fluids were field tested for two years in vehicles operating at the Tropic Test Center (TTC), Panama Canal Zone and the Yuma Proving Ground (YPG), Arizona and for one year at the Arctic Test Center (ATC), Fort Greeley, Alaska. After two years service at the TTC and YPG, the water intolerant silicone fluids were significantly better than the water tolerant silicone and the conventional brake fluid with respect to metal corrosion. At ATC, tests on the two water intolerant silicone fluids were discontinued because of possible crystallization at low temperatures and were replaced midway through the first year with fluids having improved low-temperature properties. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N77-13227*# AeroChem Research Labs., Inc., Princeton, N.J.
ENVIRONMENTAL EFFECTS OF SPACE SHUTTLE SOLID ROCKET MOTOR EXHAUST PLUMES
BaoChuan Hwang and Harold S. Pergament Jul. 1976 51 p refs
(Contract NAS1-14271)
(NASA-CR-145079; AeroChem-TP-343) Avail: NTIS HC A04/MF A01 CSCL 21I

The deposition of NOx and HCl in the stratosphere from the space shuttle solid rocket motors (SRM) and exhaust plume is discussed. A detailed comparison between stratospheric deposition rates using the baseline SRM propellant and an alternate propellant, which replaces ammonium perchlorate by ammonium nitrate, shows the total NOx deposition rate to be approximately the same for each propellant. For both propellants the ratio of the deposition rates of NOx to total chlorine-containing species is negligibly small. Rocket exhaust ground cloud transport processes in the troposphere are also examined. A brief critique of the multilayer diffusion models (presently used for predicting pollutant deposition in the troposphere) is presented, and some detailed cloud rise calculations are compared with data for Titan 3C launches. The results show that, when launch time meteorological data are used as input, the model can reasonably predict measured cloud stabilization heights. Author

N77-13228# Institut Franco-Allemand de Recherches, St. Louis (France).
SHAPED CHARGE PHYSICS. EXPERIMENTAL RESULTS AND RECENT THEORY [LA PHYSIQUE DE LA CHARGE CREUSE: RESULTATS EXPERIMENTAUX ET CONSIDERATIONS THEORIQUES RECENTES]
E. Perez 28 Oct. 1974 43 p refs In FRENCH
(ISL-39/74) Avail: NTIS HC A03/MF A01

A critical analysis of previous work on shaped charges was performed. Theories were reviewed and compared to experimental results. In particular the hypothesis underlying the HOCC computation code are discussed. As a result various experimental techniques are proposed in order to obtain a continuous analysis of hollow charge physics. It is expected that a new dynamic model will emerge from results of the proposed experiments. ESA

N77-13229# Bureau of Mines, Washington, D.C.
HISTORICAL FUELS AND ENERGY CONSUMPTION DATA, 1960 - 1972, UNITED STATES BY STATES AND CENSUS DISTRICTS EAST OF THE MISSISSIPPI
Lulie H. Crump May 1976 462 p
(PB-255176/0; BM-IC-8704) Avail: NTIS HC A20/MF A01 CSCL 21D

Salient historical data on consumption of fuels and energy are summarized by state and census district for the years 1960 through 1972. Data are given for the residential, commercial, industrial, and transportation sectors. GRA

N77-13230# Bureau of Mines, Washington, D.C.
HISTORICAL FUELS AND ENERGY CONSUMPTION DATA, 1960 - 1972, UNITED STATES BY STATES AND CENSUS DISTRICTS WEST OF THE MISSISSIPPI
Lulie H. Crump May 1976 431 p
(PB-255177/8; BM-IC-8705) Avail: NTIS HC A19/MF A01 CSCL 21D

For abstract, see N77-13229.

N77-13231# Naval Air Propulsion Test Center, Trenton, N.J. Dept. of Propulsion Technology and Projection Engineering.
EVALUATION OF A JP-5 TYPE FUEL DERIVED FROM OIL SHALE Interim Report
J. Solash, C. J. Nowack, and R. J. Delfosse May 1976 47 p refs

(AD-A025417; NAPTC-PT-82) Avail: NTIS HC A03/MF A01 CSCL 21/4

A kerosene fuel derived from oil shale was evaluated for suitability as a substitute for petroleum derived JP-5. Engine performance and gaseous emissions were evaluated using a T63-A-5A engine. Specification analyses were performed to determine conformance with the MIL-T-5624J specification for JP-5 grade fuel. Engine performance of the oil shale derived fuel was equivalent to that of a typical petroleum derived JP-5. While carbon monoxide (CO) and unburned hydrocarbon (THC) emissions of the oil shale fuel were equivalent to those of petroleum fuels, the nitrogen oxides were higher for the oil shale fuel. A high concentration of fuel bound nitrogen was implicated as the cause for the high nitrogen oxide emissions. The oil shale derived fuel was found not to conform to specifications for contamination, existent gums, thermal stability, freeze point and viscosity at -34.5 C (-30 F). A program of post-refinery upgrading studies was initiated in order to improve these deviant properties. This program included filtration, distillation, clay and acid treatment and urea extraction. It was found that no one single post-refinery treatment could improve all deviant properties. Author (GRA)

N77-13232# Mitre Corp., McLean, Va.
SURVEY OF ALCOHOL FUEL TECHNOLOGY, VOLUME 1
Bernard Baratz, Robert Ouellette, Wayne Park, and Betsy Stokes Nov. 1975 143 p refs 2 Vol.
(Contract NSF C-925)
(PB-256007/6; M74-61-Vol-1) Avail: NTIS HC A07/MF A01

Information on alcohols as fuels is presented. Current and ongoing research is tabulated. GRA

N77-13233# Mitre Corp., McLean, Va.
SURVEY OF ALCOHOL FUEL TECHNOLOGY, VOLUME 2
Betsy Stokes and Wayne Park Nov. 1975 68 p refs 2 Vol.
(Contract NSF C-925)
(PB-256008/4; M74-61-Vol-2) Avail: NTIS HC A04/MF A01

A bibliography covering all aspects of alcohol fuel technology is presented. GRA

N77-13234# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
THE IMPACT OF JP-4/JP-8 CONVERSION ON AIRCRAFT ENGINE EXHAUST EMISSIONS Interim Technical Report, Jul. 1975 - Feb. 1976
William S. Blazowski May 1976 52 p refs
(AF Proj. 3048)
(AD-A026546; AFAPL-TR-76-20) Avail: NTIS HC A04/MF A01 CSCL 21/4

The proposed conversion of predominant Air Force fuel usage from JP-4 to JP-8 has created the need to examine the dependence of engine pollutant emission on fuel type. Available data concerning the effect of fuel type on emissions has been reviewed. T56 single combustor testing has been undertaken to determine JP-4/JP-8 emission variations over a wide range of simulated engine cycle operating conditions at idle. In addition, a J85-5 engine was tested using JP-4 and JP-8. Results of the previous and new data collectively led to the following conclusions regarding conversion to JP-8: (a) HC and CO emission changes will depend upon individual combustor design features, (b) no change to NOx emission will occur, and (c) an increase in smoke/particulate emissions will result. It is recommended that these findings be incorporated into air quality analytical models to define the overall impact of the proposal conversion. Further, it is recommended that combustor analytical models be employed to attempt prediction of the results described herein. Should these models be successful, analytical prediction of JP-8 emissions from other Air Force engine models may be substituted for more combustor rig or engine testing. Author (GRA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N77-13235 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF THE MECHANISM OF CLEANING HEATING SURFACES BY THE PULSATION METHOD
Ya. M. Shchelokov, E. M. Telegin, V. N. Podymov, F. N. Imamutdinov, M. I. Kuklinskii, A. I. Berezhinskii, N. L. Semikolennykh, Yu. V. Akhmin, A. P. Bokovets, and V. I. Dmitrin 1976 14 p refs Transl. into ENGLISH from Stal (USSR), no. 4, 1976 p 377-380
(BLL-M-25448-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The mechanism of the removal of dust deposits from tube surface under the action of flame pulsations was analysed on an experimental rig. The main cleaning effect is secured by the shock wave; impetus of the jet and the stream of gases flowing over the surface play no substantial part. A pulsation cleaning system is described for an operating experimental converter-gas waste-heat boiler. Author

N77-13236 Denver Univ., Colo.
MICROSCOPIC THEORY OF BOSON-FERMION MIXTURES AT VERY LOW TEMPERATURES Ph.D. Thesis
Ronald Blatherwick 1976 112 p
Avail: Univ. Microfilms Order No. 76-24413

A transformed formulation of the theory, which appears to converge rapidly at low temperatures, has been developed. It has been shown that renormalization corresponds to a transformation from a particle representation to a quasiparticle representation of the theory, in which the boson and fermion quasiparticle energies and momentum distribution functions appear as a natural consequence of the renormalization. The vertex functions appearing in the diagrammatic expansions employed in the theory have been expressed in terms of matrix elements of the two-particle interaction. Calculations of the entropy and total energy of the system, as well as the boson and fermion quasiparticle energies and momentum distribution functions, have been made through second order in matrix elements of the two-particle interaction. The boson quasiparticle energy has been shown to be phonon-like at low temperatures and to approach a zero momentum limit of zero, through second order.
Dissert. Abstr.

N77-13237*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERVIEW OF NASA/OAST EFFORTS RELATED TO MANUFACTURING TECHNOLOGY
Neal T. Saunders 11 Nov. 1976 10 p Presented to the MTAG-76 DOD Tri-service Conf. on Manufacturing Technol., Arlington, Tex., 8-11 Nov. 1976
(NASA-TM-X-73538) Avail: NTIS HC A02/MF A01 CSCL 13H

An overview of some of NASA's current efforts related to manufacturing technology and some possible directions for the future are presented. The topics discussed are: computer-aided design, composite structures, and turbine engine components.
Author

N77-13238# European Space Agency, Paris (France).
PROBLEMS OF SPACE AND TERRESTRIAL MICROWAVE PROPAGATION
W. Riedler, ed. (Tech. Hochschule, Graz) and W. Lothaller, ed. (Austrian Space Agency) May 1976 286 p refs Partly in ENGLISH and FRENCH Proc. of Intern. Symp. held at Graz, Austria, 7-9 Apr. 1975; co-sponsored by Austrian Space Agency and Tech. Hochschule, Graz
(ESA-SP-113) Avail: NTIS HC A13/MF A01

The latest theoretical and experimental results concerning the impairments of microwave signals due to atmospheric phenomena are reported. The contributions were organized as follows: communication requirements and meteorological aspects effecting the use of frequencies above 12 GHz for telecommunications; problems of space-microwave propagation; and problems of terrestrial microwave propagation. For individual titles, see N77-13239 through N77-13266.

N77-13239# Technische Hochschule, Graz (Austria). Inst. fuer Nachrichtentechnik und Wellenausbreitung.
THE NEED FOR MICROWAVE PROPAGATION RESEARCH

W. Riedler *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 1-6 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

The importance of microwave propagation research for modern telecommunications, especially for satellite and terrestrial links, is discussed. Interrelations between meteorological and wave propagation measurements are considered and their use for communication system design demonstrated. Relation is made to the topics of the three sessions of the Graz International Microwave Symposium, 7-9 April 1975. Author (ESA)

N77-13240# Rome Univ. (Italy).
COMMUNICATION REQUIREMENTS FOR TERRESTRIAL AND SPACE RADIO-LINKS AT FREQUENCIES ABOVE 10 GHz **c32**
B. Peroni *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 7-14 (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

The communication requirements of point-to-point radio links for public services at frequencies above 10 GHz are dealt with considering links used for digital transmission. Requirements connected with propagation characteristics are emphasized, especially the attenuation due to the atmosphere and the hydrometers affecting the transmission quality of the radio links, both directly and indirectly. Communication requirements for the fields of application in which the use of digital radio links is envisaged are discussed, reference being made to telephony such as satellite links, and urban and metropolitan trunks. The design of radio links must be based on a knowledge of the statistical properties of rainfall. ESA

N77-13241# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Atmosphaerenphysik.
RAINDROP AND HAILSTONE SPECTRA FROM SEVERE STORMS **c32**
A. Waldvogel *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 15-24 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Size distributions of raindrops and hailstones measured continuously and automatically during severe thunderstorms are presented. Only storms with rainfall rates higher than 100 mm/h are considered. The distributions were measured by instrumented trucks directed by radio on radar information. It was found that the 'classical' exponential law -N(D) = N sub O exp (-lambda D) is a good approximation for raindrop as well as hailstone spectra. The intercept N sub O, however, is not at all constant or dependent on the rainfall rate in a simple way, but changes drastically even within the same storm. This lack of dependence was also found for the slope. These variations are due to strong changes of the concentration of the hydrometeors in a thunderstorm cell. The time of these changes at one point is in the order of minutes, the equivalent distance of the order of one km as shown by radar pictures. Maximum values of quantities such as water content, the attenuation, the rainfall rate, or the reflectivity factor also show strong variations and, in the worst case, highly exceed the mean values. Some discussion is included on the parameterization of the spectra and the consequences of the interpretation. Author (ESA)

N77-13242# Politecnico di Milano (Italy). Ist. di Elettronica.
SOME RAINFALL RATE STATISTICS FROM RADAR DATA **c47**
A. Pawlina *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 25-31 ref (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

A whole summer of radar observations in the region of Montreal was analyzed in terms of point rainfall rate at the ground and cellular structure of storms. The point rainfall rate statistics presented are the rainfall rate distribution and the spatial joint probability for a number of points at various spacings. The results are compared with statistics obtained from raingage measurements. For the cellular structure of the storms the statistics presented are: number of cells for a given rainfall rate threshold; cell size distribution in function of the rainfall rate threshold and storm intensity; and modal structure of cells, that is, the number of cells of higher thresholds contained in a cell as a function of the threshold. The more interesting results are: a good fit between rainfall rate distributions obtained from rain gage and radar observations; the exponential character of cell size distribution; and the existence of a relation between cell size distribution and storm intensity. It is concluded that these statistics could be useful in ground microwave link studies and hydrological studies. Author (ESA)

N77-13243# European Space Research and Technology Center, Noordwijk (Netherlands).
A NEW THEORY ON RAINDROP CANTING AND ITS APPLICATION TO MICROWAVE CROSS-POLARISATION STUDIES **c32**
G. Brussaard *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 33-41 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

The model presented tries to close the gap in the theory of cross-polarization on linear polarized microwave links. It gives the theoretical relationship between wind gradients and cross-polarization and allows predictions of cross-polarization to be made which are based on meteorological data. A comparison between terrestrial links and the first part of satellite links is made, based on the model. The requirements for experiments to test the validity of the theory are outlined. ESA

N77-13244# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
THEORETICAL AND EXPERIMENTAL DETERMINATION OF RAIN ATTENUATION ON A RADIOELECTRIC LINK RADIO PATH [DETERMINATION THEORIQUE ET EXPERIMENTALE DE L'AFFAIBLISSEMENT PAR LA PLUIE SUR UN TRAJET RADIOELECTRIQUE] **c32**
P. Misme and J. Fimbel *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 43-59 refs In FRENCH (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

A model for relating statistically the rain intensity value to the rain attenuation on 10 GHz radio links was established. Some precipitation characteristics interesting to telecommunication are presented. The distribution function of rain attenuation on a radio link was determined theoretically. Some characteristic precipitation parameters are discussed. The attenuation coefficient for a precipitation probability was calculated and its accuracy estimated. Applications of this model to some sites in France are given. ESA

N77-13245# Post Telefon und Telegrafen Betriebe, Bern (Switzerland). Abteilung Forschung und Entwicklung.
PROBABILITIES OF THE OCCURRENCE OF RAIN CELLS AND RAIN ATTENUATION **c32**
W. E. Debrunner *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 61-71 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

An experiment for investigations of the spatial and temporal distributions of rain cells along a path of 70 km is described including the installation and operation of weather radar measuring bi-static rain scatter. A statistical model based on the concept of rain cells is given. It is shown that the influence of the microclimate of rain attenuation statistics is comparable to an increase in the path length by a factor of two. ESA

N77-13246# European Space Research and Technology Center, Noordwijk (Netherlands).
NEEDS FOR PROPAGATION RESEARCH IN VIEW OF THE EUROPEAN COMMUNICATION SATELLITES PROGRAMME **c32**
R. Martinon *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 73-83 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

In the framework of the European Communication satellite program, a propagation research program was initiated by ESRO in addition to other experiments set up by other institutes. New

propagation problems created by the ECS system constraints and by similar systems intended for other missions were investigated. Propagation phenomena such as scattering, attenuation, depolarization and possible gain limitation of large aperture antennas, band width limitation due to propagation medium, scintillation, and fluctuations of RF signals are reviewed. The most important effect is attenuation due to absorption and depolarization. In order to assess the order of magnitude of depolarization and to correlate the latter with attenuation, some radiometric experiment projects are described. Early conclusions are drawn from ground measurement results on attenuation and depolarization. ESA

N77-13247# Politecnico di Milano (Italy).
OPPORTUNITIES OFFERED BY THE SIRIO SATELLITE FOR PROPAGATION RESEARCH **c32**
F. Carassa *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 85-92 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

The SHF experiment to be carried out using the Italian Sirio satellite is aimed mainly at investigating the propagation of frequencies above 10 GHz and the application of these frequencies to satellite communication systems. The configuration of the Sirio-SHF experiment and its related onboard equipment is presented along with Italian earth stations. Laboratory tests on the satellite transponder and the earth equipment are detailed. Propagation experiments with smaller stations equipped with smaller antennas and less powerful transmitters are described. The characteristics of the meteorological radar of Spino d'Adda for propagation research at SHF frequencies (above 10 GHz) as well as rain modelling studies are outlined. Author (ESA)

N77-13248# Post Office Research Dept., Ipswich (England).
SATELLITE PROPAGATION AND INTERFERENCE EXPERIMENTS AT THE UK POST OFFICE RESEARCH CENTER **c32**
J. Thirlwell *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 93-102 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

The satellite systems propagation research program is reviewed. The most efficient design of satellite communication systems can only be achieved if sufficient long-term statistical data on the propagation characteristics of the satellite slant paths are available at the required operating frequencies. Ideally such propagation data should be obtained using test signals received from geostationary satellites. In the absence of suitable experimental satellites, the U.K. Post Office Research Department has been using radiometers to collect slant path propagation data in the form of sky noise temperature since 1968. These measurements were made at 3.95, 11.75, and 17 GHz for slant path elevation angles of 5 and 20 deg. The measurements are continuing at 17 and 12 GHz. 20 and 30 GHz radiometers will be built and calibrated using attenuation data obtained with the ATS 6 satellite. Slant path attenuation and depolarization measurements are planned using the ATS 6 and OTS satellites when they become available this year and in 1977, respectively. The 20 and 30 GHz signals transmitted by ATS 6 will be received. It is proposed to transmit to and receive signals from OTS at frequencies of 14 and 12 GHz, respectively. Finally, a coordination experiment is planned to investigate the interference between terrestrial links and a satellite earth station at frequencies of 12 and 17 GHz.
Author (ESA)

N77-13249# European Space Research and Technology Center, Noordwijk (Netherlands).
RESULTS OF 30 MONTHS RUNNING OF THE ESRO RADIOMETER EXPERIMENT **c46**
F. M. Galante *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 103-111 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Within the framework of the planning of a communications satellite system for Europe operating at 11 and 14 GHz, the European Space Agency has, since 1971, been undertaking a series of atmospheric emission measurements. The main purpose of the experiment is to build up statistics of attenuation due to rain at those frequencies, based upon a large number of experimental results gathered at different locations. Data gathered up to Sept. 1974 at six locations on attenuation at 11 and 14 GHz are presented. The fade duration is analyzed. Two significant correlation effects are emphasized: between attenuation due to rain and antenna elevation angle, and between attenuation due to rain and the maximum rainfall rate measured at the site.
ESA

N77-13250# Post Telefon und Telegrafen Betriebe, Bern (Switzerland). Abteilung Forschung und Entwicklung.
MEASUREMENT OF ATTENUATION AND CIRCULAR CROSS-POLARISATION DISCRIMINATION AT 13 GHz ON A SLANT PATH **c32**
C. H. Zufferey *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 113-120 refs (For primary document see N77-13238 04-31)
(Contract ESRO-1672/72-SW)
Avail: NTIS HC A13/MF A01

Statistical results on continuous measurements taken at 13 GHz on a 10 km link in the Swiss Alps since April 1973 are reported. The main characteristics of this oblique path which lends to the simulation of a satellite to earth link, as far as tropospheric effects are concerned, are shown. Relationships between various phenomena such as circular cross polarization discrimination vs copolar attenuation and attenuation vs rainfall rate are presented. ESA

N77-13251# Telespazio, S.p.A., Rome (Italy).
ATTENUATION AND DEPOLARISATION MEASUREMENTS ON AN INCLINED PATH AT 11 GHz **c32**
G. Possenti *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 121-128 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

An experiment falling within propagation research activities promoted in European countries by ESRO is described. The experiment is aimed at investigating the propagation behavior of the atmosphere at 12 GHz over an inclined terrestrial path, which can simulate an earth/satellite link and is of great interest since frequencies above 10 GHz will be used in the OTS and Sirio space programs. Statistical results on atmospheric attenuation, rain rate, and polarization isolation, as well as their correlation, were analyzed. It is estimated that satellite services should not have an X polar isolation lower than 25 dB for more than 0.01% of the time in a year. Author (ESA)

N77-13252# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
INTRODUCTION TO THE EQUIVALENT DISTANCE IN THE CALCULATION OF OBLIQUE PATH ATTENUATION: APPLICATION TO A 20 GHz RADIOMETRIC MEASUREMENT [INTRODUCTION DE LA NOTION DE DISTANCE EQUIVALENTE DANS LE CALCUL DES AFFAIBLISSEMENTS SUR UNE LIAISON OBLIQUE: APPLICATION A UNE MESURE RADIOMETRIQUE A 20 GHz] **c32**
J. Fimbel and P. Misme *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 129-134 refs In FRENCH (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Solar radiometer measurements of attenuation by rain are often altered by the diurnal variations of strong rainfall. A correcting method applied to measurements carried out for 33 months using a radiometer at 20 GHz located in the Paris region is presented. The principles of measurement are reviewed. Experimental results were analyzed. A mathematical model for the computation of rain attenuation on a horizontal path was applied to an oblique path taking into account the attenuation due to clouds, gases, and precipitation height. This model, the results of which agree with experimental results, allows investigation of the influence of the elevation angle on the attenuation and the determination of precipitation height. Using this method it is possible to convert radiometer measurements into measurements of attenuation which should have been obtained on an earth/geostationary satellite path. ESA

N77-13253# AEG-Telefunken, Backnang (West Germany).
AUTOMATIC COMPENSATION OF CROSS-POLARISATION

COUPLING IN COMMUNICATION SYSTEMS USING ORTHOGONAL POLARISATIONS c32

H. Kannowade *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 135-146 refs (For primary document see N77-13238 04-31)

Avail: NTIS HC A13/MF A01

In frequency re-use satellite communication systems using orthogonally polarized waves, depolarization mainly due to rain and Faraday rotation reduces channel isolation. Several methods to compensate cross-polarization coupling have been proposed. The principles of the cancellation - or cross-coupling method - and of T. S. Chu's method are briefly explained. Possible circuit realizations for Chu's method are given. The compensation can be performed in a dual polarized waveguide section or in a system with two separate lines. An automatic control system which avoids iterative methods or real time computations is proposed. Control voltages are generated on the receive side by coherent demodulation of beacons contained in the communication channels. Slightly modified conventional tracking receivers may be used for the demodulation. How the control system reaches its steady state is demonstrated for several depolarization conditions. Author (ESA)

N77-13254# Technische Hogeschool, Eindhoven (Netherlands).

A COMPARISON OF EIGHT ANTENNA TYPES FOR SATELLITE COMMUNICATION GROUND STATIONS c33

J. Dijk and E. J. Maanders *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 147-158 refs (For primary document see N77-13238 04-31)

Avail: NTIS HC A13/MF A01

Antenna gain G and system noise temperature T sub s of eight antenna types (focal point paraboloid, classical cassegrain antenna, shaped cassegrain antenna, open cassegrain antenna, shaped open cassegrain antenna, paraboloid-plane reflector antenna, cord antenna, and shaped cord antenna) were compared at a frequency of 4 GHz in order to draw conclusions for the use of these antennas for satellite communication ground stations by means of the figure of merit G/T sub s. The antenna losses and noise contributions were found by investigating all parts of the composite system such as the feed, subreflector, main reflector, and microwave components. It is concluded that shaped antenna systems are the most favorable, with emphasis on the shaped symmetrical cassegrain antenna which is the most economical, and therefore very popular as ground station antenna for satellite communications. Author (ESA)

N77-13255# Helsinki Univ. of Technology, Otaniemi (Finland).

EXPERIMENTS PERFORMED AT THE RADOME COVERED GROUND STATION IN FINLAND c32

H. Sandell *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 159-164 refs (For primary document see N77-13238 04-31)

Avail: NTIS HC A13/MF A01

A new earth station to be used for telecommunication and radioastronomical research is described. The antenna system, a cassegrain-type with a main reflector diameter of 13.7 m, is covered by a self-supporting metal space frame radome consisting of 570 triangular aluminum panels. Radome effects on the total transmission loss as well as attenuation due to rain and snow are discussed. It was found that the measured transmission losses are higher than those estimated by the manufacturer. ESA

N77-13256# Fondazione Ugo Bordoni, Rome (Italy).

EUROPEAN RESEARCH ACTIVITIES ON RADIO-WAVE PROPAGATION ABOVE 10 GHz IN THE FRAMEWORK OF COST c32

F. Fedi *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 165-178 refs (For primary document see N77-13238 04-31)

Avail: NTIS HC A13/MF A01

The European joint research program on the influence of atmospheric conditions on electromagnetic wave propagation above 10 GHz implemented within the framework of the Eurocop-Cost (EUROpean Cooperation and Coordination in the field of Scientific and Technical research) projects in the field of telecommunications, is illustrated. The aims, type of cooperation envisaged, and criteria governing the research program are described. The experiments under way in the various countries participating in the project and the major results which may be expected at the end of the project are reviewed. They are divided into six categories: national network meteorological stations; special meteorological stations; experimental areas; radiolinks with meteorological measurements; radio links, and radiometric experiments. Author (ESA)

N77-13257# Essex Univ., Colchester (England).

CROSS-POLARISATION MEASUREMENTS AT 11 AND 22 GHz IN EASTERN ENGLAND c32

B. G. Evans, P. T. Thompson (Post Office Res. Dept., Ipswich, Engl.), and D. J. W. Turner (Post Office Res. Dept., Ipswich, Engl.) *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 179-196 refs (For primary document see N77-13238 04-31)

Avail: NTIS HC A13/MF A01

Meteorological conditions which can cause cross-polarization of an electromagnetic wave at microwave frequencies are described and a brief survey is made of progress in relating cross-polarization to these conditions. Two experimental linearly polarized radio links (22 GHz, 4 km and 11 GHz, 1.6 km) located in eastern England are described, together with a technique for improving the sensitivity of cross-polar measurements by improving clear weather cross-polar isolation. Cumulative frequency distribution of excess path attenuation and cross-polarization are presented for periods of 16 and 18 months for both links, and examples of cross-polarization measured under different meteorological conditions are discussed. Author (ESA)

N77-13258# Posterijen, Telegrafie en Telefonie, The Hague (Netherlands). Dr. Neher Lab.

AN EXPERIMENTAL RADIO LINK FOR THE INVESTIGATION OF THE DEPOLARISATION OF HORIZONTAL AND VERTICAL POLARISED SIGNALS AT A FREQUENCY OF 11.5 GHz c32

M. A. Reinders and J. F. Spee *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 197-205 (For primary document see N77-13238 04-31)

Avail: NTIS HC A13/MF A01

The link, designed to achieve a signal-to-noise ratio of at least 70 dB, includes a transmitter, receiver, combined electronic switch and sample-and-hold circuit, a logarithmic amplifier, an orthomode transducer, and a Cassegrainian type illuminating system. Experience with this link installed on a 31.4 km path gives the impression that the degradation of the decoupling due to rainfall was less severe than during multipath propagation. ESA

N77-13259# Technische Hogeschool, Eindhoven (Netherlands).

THE ANALYSIS OF THE PROPAGATION DATA OF THE LINE-OF-SIGHT MICROWAVE LINK GUNUNG SANDAGAN - SURABAYA (INDONESIA) FOR THE WET SEASON c32

J. Neessen *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 207-215 refs (For primary document see N77-13238 04-31)

Avail: NTIS HC A13/MF A01

Since Indonesia consists of many islands, the investigation of line-of-sight microwave links, which show a radio path over water, is important. It is well known that links over water have worse fading characteristics than links over land. So for the Indonesian microwave network under construction, the links over water are the weakest in the chain. The line-of-sight microwave link Gunung Sandagan (on the island of Madura) to Surabaya (on the island of Java) is analyzed. The radio path crosses the Madura Strait. The distance between the transmitter and the receiver is 50.6 km and the operating frequency is 4 GHz. The paraboloid reflector antennae have a diameter of 3 m. The signal at the output terminal of the receiver was analyzed by equipment which produces a photograph of the displays and relays, counting the time when a defined level is exceeded. The counting frequency was 10 Hz and a picture was made each full hour. In this way the analysis went on automatically all day and night. Author (ESA)

N77-13260# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).

EXPERIMENTAL INVESTIGATION OF A LINK AT 13 GHz

ON 53 km: ATTENUATION AND CROSS POLARIZATION [ETUDE EXPERIMENTALE D'UNE LIAISON A 13 GHz SUR 53 km: AFFAIBLISSEMENT ET DECOUPLAGE DE POLARISATION] **c32**

M. Rooryck and J. Battesti *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 217-227 refs In FRENCH (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Propagation measurements are presented and discussed. The influence of multipath propagation and of rainfall on the duration and value of attenuation as well as on the cross polarization is discussed. The results of measurements show the importance of the multipath propagation degradation effect on the radio link quality while a very weak attenuation due to rainfall was observed. ESA

N77-13261# Universite Catholique de Louvain (Belgium).
DEPOLARISATION AND DOUBLE POLARISATION RADIOMETRY AT 12 GHz: THEORETICAL AND EXPERIMENTAL RESULTS **c32**

P. Delogne, M. Lobelle, P. Sobieski, and J. vanVyve *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 229-239 refs (For primary document see N77-13238 04-31) (Contracts ESTEC-1997/73-MD; ESTEC-2014/73-MD)
Avail: NTIS HC A13/MF A01

A theoretical approach including the incoherent scattering by spherical or non-spherical randomly or preferentially oriented raindrops was formulated by means of the radiative transfer equation. The numerical analysis shows that incoherent scattering by spherical raindrops cannot explain the observed cross-polarization levels. The latter are probably due to incoherent scattering by non-spherical raindrops randomly oriented. The experimental results on 2 km horizontal depolarization link and double-polarization radiometry seem to show that incoherent depolarization can be important in some cases and that differential antenna noise temperature occurs at the beginning of a rain shower but are not sufficient to draw conclusions. ESA

N77-13262# Universite Catholique de Louvain (Belgium).
DATA ACQUISITION AND HANDLING OF THE LOUVAIN-LA-NEUVE EXPERIMENTS **c32**

E. Gaudissart, A. Laloux, and C. deWinter *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 241-247 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Three experimental links are working on the site. The depolarization of a CW signal at 12 GHz on a 2 km path was measured. In the same direction, at about the same frequency, a radio is pointed at a 30 deg elevation angle. A third link, where the signal is reflected on a plane reflector 350 m away from the transmitter-receiver, measures the attenuation at 12 and 35 GHz. All the equipment is connected to an analog recorder and to a minicomputer. The acquisition system of the Louvain-la-Neuve experimental area, completely automated, provides attenuation at 12 and 35 GHz, sky noise temperature at 12 GHz, and the depolarization matrix at this frequency on a magnetic tape. It has been proved that even with a sophisticated system, the statistical method cannot be roughly applied. ESA

N77-13263# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.
THE 13.5 TO 15.0 GHz SWEEP AMPLITUDE AND PHASE PROPAGATION MEASUREMENTS **c32**

E. Lintz Christensen *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 249-256 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Equipment for measurements of amplitude, differential phase, and differential gain of a line of sight propagation path developed for sweep measurements over the frequency band 13.5 to 15.0 GHz is described. The measurement system was made in order to obtain data for propagation prediction at frequencies above 10 GHz. Furthermore, the data offers new possibilities for the understanding of the propagation of microwaves. The equipment has been in successful operation since June 1974 on an overland path of 44.7 km in Denmark. Rain gages are situated along the path in order to obtain statistical information of rain and snow simultaneously with the propagation measurements. Other rain gages will be placed around the country to permit prediction of path attenuation due to precipitation on a statistical basis. Author (ESA)

N77-13264# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.
ANALYSIS OF 13.5 TO 15 GHz AMPLITUDE AND PHASE PROPAGATION DATA **c32**

G. Mogensen *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 257-263 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Data from swept propagation experiment have been collected since June 1974. The experiment is carried out in order to obtain improved knowledge about those propagation conditions (e.g. multipath and precipitation) which impair the quality of line of sight microwave links. The basic idea is to measure the complex transfer function of the propagation path in a certain frequency band; therefore, the data are applicable in analyzing microwave links with all kinds of modulation schemes. It is not possible to measure the complex transfer function directly, but the measured parameters allow calculation of all the interesting properties. A comprehensive collection of propagation data from a single path is formed during a period of two years of measurement. The data are recorded in a way which allows several different kinds of analysis to be made without the need of relying on any specific propagation mechanism. The results of the analyses carried out on different modulation systems may then give appropriate information to select the one most suitable to optimize the amount of reliable traffic transmitted within the available frequency bands. Author (ESA)

N77-13265# Finnish Administration of Posts and Telegraphs, Helsinki. Radio Div.
RAIN ATTENUATION MEASUREMENT WITH AN OPEN RESONATOR **c32**

T. Haikonen *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 265-267 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Attenuation caused by rain at frequencies above 10 GHz was measured with open resonators by comparing the amplitude of the resonant field or the quality factor Q of the resonator, as modified by rain, with corresponding values when there is no rain. This comparison is meaningful only if the resonant pattern is not altered by the rain. If for instance the width of the field distribution is changed, a change of the diffraction losses at the reflectors is evident and accurate determination of the losses induced by rain will be difficult. It is shown that, at least up to 30 GHz, the rain causes negligible changes in the resonant patterns of an open resonator if the dimensions of the reflectors are small compared with the distance between the reflectors.
Author (ESA)

N77-13266# Technische Hochschule, Graz (Austria). Inst. fuer Nachrichtentechnik und Wellenausbreitung.
SOME ASPECTS OF SPECIAL METEOROLOGICAL EQUIPMENT **c09**

R. Lang *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 269-272 (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

Several radio links in the frequency range from 10 to 20 GHz were planned for investigation of attenuation, cross polar isolation, and diversity with special emphasis on correlation of meteorological phenomena with propagation problems. About 50 meteorological stations, spread over an area of 200 sq km, were envisaged. For two years one of the test links mentioned has operated at 11.3 GHz over 15.1 km distance between the Schoeckel, a mountain near Graz, and the Institute of Communications and Wave Propagation. Fifteen of the meteorological stations capable of controlling, converting, and integrating the output of up to 32 different gages are described. The meteorological parameters measured are rain temperature, humidity, and air pressure, with an integration time of one sec. A detailed block diagram of the circuitry of a meteorological station is shown.
Author (ESA)

N77-13267# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
RIGID PLASTIC FOAM INSULATION FOR CRYOGENIC APPLICATION Final Report
Heinrich Mathes, Helmar Langer, and Rudolf Sangkohl Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 86 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-31) Avail: NTIS HC A05/MF A01; ZLDI, Munich, DM 17,65

Mechanical and physical properties of rigid foam materials necessary for cryogenic applications are described. The following data from PVC, PUR and PMI rigid foams were determined: tensile strength, stress-strain diagram, compressive strength, specific dates of thermal conductivity, permeability to gas, and contractive behavior at low temperature. The testing methods applied are described and the results are tabulated. Efficiency data for the determination of selection principles were established. Author (ESA)

N77-13268# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
THE ARCTIC ENVIRONMENT AND THE ARCTIC SURFACE EFFECT VEHICLE Final Report, 1970 - 1975
K. F. Sterrett Jan. 1976 36 p refs
(ARPA Order 1615)
(AD-A024849; CRREL-76-1) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report summarizes the advances in understanding of the Arctic which have come about since the inception of the ARPA Arctic Surface Effect Vehicle Program in 1970, primarily as the result of CRREL's participation. Major efforts to increase knowledge of sea ice, terrestrial, and coastal topographic features are described. Special emphasis is placed upon the quantitative understanding of pressure ridging. Other areas of major interest are atmospheric characteristics and ecological effects. A list of publications generated is included.
Author (GRA)

N77-13269# Oregon Univ., Eugene. Dept. of Marketing, Transportation and Business Environment.
AN INVESTIGATION OF CHANGE IN DIRECT LABOR REQUIREMENTS RESULTING FROM CHANGES IN AIRFRAME PRODUCTION RATES Final Report Ph.D. Thesis
Larry L. Smith Jun. 1976 166 p refs
(AD-A026112; AFBRMC-B-2-2-75) Avail: NTIS HC A08/MF A01 CSCL 13/8

The purpose of this research is to develop a procedure to consider the effect of a production rate change on direct production labor requirements for additional airframe production. The procedure encompasses the needed elements of data collection, variable formation, data analysis and forecasting. In the following chapter, airframe cost elements are discussed, and the topic is narrowed to estimating airframe direct production labor hours. A third chapter summarizes previous studies in the area. The fourth chapter outlines the approach for conducting the research and identifies sources of data. An analysis of the data is presented in the fifth chapter. The paper closes with a summary, some conclusions and suggestions for further research. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N77-13270 British Library Lending Div., Boston Spa (England).
140 MBIT/S DIGITAL TRANSMISSION SYSTEM OF HYBRID TYPE ON COAXIAL CABLE
B. Fabbri, L. Sacchi, F. Tosco, and G. Veglio 27 Apr. 1976 29 p refs Transl. into ENGLISH from CSELT Rapporti Tech. Italy, no. 1, Apr. 1975 p 3-18
(BLL-Trans-3302-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.

An experimental 140 Mbit/s hybrid type transmission system on a 1.2/4.4 mm coaxial cable was developed. The project criteria of the system are described with particular regard to its dimensioning and to the choice of the line code. The analogue repeaters and the transmit and receive terminals are discussed emphasizing the peculiarities and the main characteristics of the different components. The main results at present available are given for the tests on the experimental system. Author

N77-13271 British Library Lending Div., Boston Spa (England).
NEW WAYS OF TEXT AND GRAPHICS COMMUNICATION: A PROJECT FOR THE ELECTRONIC LETTER TRANSMISSION
D. Becker 30 Jul. 1976 20 p Transl. into ENGLISH from Nachrtech. Z. (West Ger.), v. 29, no. 3, Mar. 1976 p 222-228
(BLL-Trans-3374-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.

Electronic letter transmission consists of two parts: the electronic mail service for the input of letters through public input equipment (electronic letter boxes), their storage, transmission and output at the destination post office, as well as the integrated communication service which connects subscriber equipment for office rationalization and internal/external electronic transmission with the electronic mail service. The electronic letter transmission system carries letters from all sender and receiver groups and together with the remaining physical delivery of letters it facilitates an economical overall system. Almost 50% of all letters are suitable for electronic transmission; this includes typed texts, as well as graphics (sketches, forms) and handwritten letters. The main advantages of electronic transmission are speed and relatively low labor costs. Electronic letter transmission is generally of advantage to the operator as well as business and private subscribers. Author

N77-13272 British Library Lending Div., Boston Spa (England).
CABLE TELEVISION (CATV). SUBJECTIVE ASSESSMENT OF THE QUALITY GRADE OF A PICTURE IMPAIRED BY CROSS-MODULATION AND BEAT
G. Zetti 21 Jun. 1976 14 p refs Transl. into ENGLISH of Elettronicae Telecomun. (Italy), v. 24, no. 4, 1975 p 157-161
(BLL-Trans-3358-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.

In cable television, using frequency multiplexed channels, the most important impairments on the picture are noise, cross-modulation and beats. The method and the results obtained are described, relevant to an investigation carried out in order to define the signal-to-beat and signal-to-cross-modulation ratios. The same quality grade was provided with respect to a reference picture impaired by white-noise interference. Author

N77-13273 British Library Lending Div., Boston Spa (England).
THE FUTURE OF TELECOMMUNICATIONS IN THE FEDERAL REPUBLIC OF GERMANY: RESULTS OF THE KTK CONFERENCES
W. Kaiser 10 Jun. 1976 77 p refs
(BLL-Trans-3370-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.

Technical aspects and costs are analyzed for existing and possible new forms of telecommunication in existing public networks, the need and demand for new forms of telecommunication such as cable television and visual telephony are explored. Author

N77-13274 British Library Lending Div., Boston Spa (England).
AN EXPERIMENTAL SYSTEM OF DATA PACKET TRANSMISSION
Yves Noirel 30 Jul. 1976 14 p Transl. into ENGLISH from Rev. de Radiodiffusion-Television (France), no. 40, 1975 p 11-17
(BLL-Trans-3378-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.

The design of an experimental system is presented for the transmission of data packets, compatible with the transmission of a television signal. The system is independent of the particular nature of the services. Standardized digital interfaces are provided at transmitter and receiver. The system offers multiple access to share out the considerable facility that a television channel can represent when it is used exclusively, in accordance with

these standards, for the transmission of data (4 Meb/s). Activity of the data sources at the transmission end are regulated to manage the communications facility in an optimum manner.
Author

N77-13275 California Univ., Los Angeles.
DIAMETER AND CONNECTIVITY CONSIDERATIONS IN THE DESIGN OF COMMUNICATION NETWORKS Ph.D. Thesis
Jehuda Hartman 1976 93 p
Avail: Univ. Microfilms Order No. 76-25203

A communication network modeled by an undirected graph without loops and multiple edges is presented. The maximal message delay index, in the network, is expressed in terms of the diameter of the graph. Three reliability measures are considered: a given minimal degree, edge-connectivity and vertex connectivity. The minimal number of vertices and edges of a 2-diameter stable graph of diameter d is obtained and bounds on the minimal number of edges of a 2-diameter stable graph on n vertices are calculated. Dissert. Abstr.

N77-13276 Stanford Univ., Calif.
SOME PROBLEMS IN ELECTROMAGNETIC DIFFRACTION BY A RIGHT ANGLE WEDGE Ph.D. Thesis
Robert Arthur Yates 1976 121 p
Avail: Univ. Microfilms Order No. 76-26095

Exact solutions are obtained to several diffraction problems in which localized sources move in the vicinity of a perfectly conducting, right-angle wedge. The technique involved is illustrated by first considering a parallel incident plane wave, and thereafter by treating a charged line in uniform parallel motion and finally dealing with a point charge moving obliquely. The corresponding boundary value problems are individually reformulated in terms of singular integral equations that characterize the currents on the wedge faces. A determination of these currents thus underlies the procedure for obtaining the electromagnetic fields. The representations for the electromagnetic fields in each of the problems takes the form of contour integrals whose properties can be ascertained by suitable manipulations. Dissert. Abstr.

N77-13277 Ohio State Univ., Columbus.
COMPARATIVE EVALUATION OF STORED-PATTERN CLASSIFIERS FOR RADAR AIRCRAFT IDENTIFICATION
Sargur N. Srihari 1976 221 p
Avail: Univ. Microfilms Order No. 76-24691

Classifier performance is evaluated in terms of misclassification probability, classification bias, computational economy, and the effect of changes in classifier parameters. These parameters include dimensionality, assumed value of the noise level, and the number of subclasses in each class. The problem of classifier design when more than one noisy pattern can be used to make a decision is investigated. This is the problem of efficient utilization of cumulative evidence to improve classifier performance. One of the procedures evaluated operates by taking a majority vote over multiple decisions of a given classifier. It is shown that the misclassification probability of a majority vote procedure increases monotonically with the classification-bias of the given classifier. Dissert. Abstr.

N77-13278 Stanford Univ., Calif.
THE CAPACITY OF THE SPECTRAL GAUSSIAN MULTIPLE-ACCESS CHANNEL Ph.D. Thesis
Carroll Wayne Keilers 1976 68 p
Avail: Univ. Microfilms Order No. 76-26026

The Shannon information theory is applied to analyze the capacity region of a channel characterized by nonwhite Gaussian noise. The achievable rate region is shown to be a capacity region. This result is analagous to the Shannon result for a single user. Dissert. Abstr.

N77-13279 Princeton Univ., N.J.
NONPARAMETRIC AND ROBUST DETECTION: DEPENDENT DATA AND CONDITIONAL TESTS Ph.D. Thesis
Saleem Abdulali Kassam 1975 192 p
Avail: Univ. Microfilms Order No. 76-25092

A class of detectors is proposed which can operate on dependent input data, for a large class of dependency structures, without losing their nonparametric performance characteristics. The proposed detectors are modifications of standard nonparametric detectors, and operate on independent sequences of multivariate data formed by appropriately grouping the dependent inputs. The structures of some new nonparametric detectors are formulated employing the concept of a conditional statistical test. These detectors are analyzed both for asymptotic and finite-sample, finite-signal performance. Dissert. Abstr.

N77-13280 Virginia Polytechnic Inst. and State Univ., Blacksburg.
AN ANALOG/HYBRID COMPUTER SOLUTION OF ELECTROMAGNETIC SCATTERING PROBLEMS Ph.D. Thesis
Edgar Littleton Coffey, III 1976 220 p
Avail: Univ. Microfilms Order No. 76-24317

Several techniques that may be used to solve exterior electromagnetic scattering problems are studied. Analytical methods, moment methods, subsectional methods, probabilistic methods, integral equation methods, and analog/hybrid computer methods were considered to determine the best method to use in a general approach to scattering problems. It was shown that while all these methods were able to solve certain classes of problems, no single technique qualified as a general solution method. A new scattering technique, the Unimóment - Monte Carlo method, was developed from the strengths and weaknesses of the more traditional methods. It is a probabilistic technique used to solve a deterministic problem. A description of the Unimoment - Monte Carlo computer system along with various factors influencing performance of the method is included.
Dissert. Abstr.

N77-13281 Illinois Univ., Urbana-Champaign.
AN INVESTIGATION OF THE CURRENT SOURCE-FUNCTION TECHNIQUE FOR SOLVING PROBLEMS OF ELECTROMAGNETIC SCATTERING Ph.D. Thesis
Donald Farness Hanson 1976 259 p
Avail: Univ. Microfilms Order No. 76-24095

The problems of scattering by a conducting half plane and by a conducting strip of finite width were examined to demonstrate the validity and feasibility of the current source-function (CSF) technique. The CSF technique for three-dimensional electromagnetics problems with time dependent incident fields was also formulated. The major contributions of the study were: (1) the formulation of the CSF technique for three-dimensional electromagnetic scattering problems with time-dependent incident fields by treating all fields and currents as Schwartz distributions, (2) the demonstration of a method for finding solutions of the homogeneous finite part integral equation, and (3) the development of consistency conditions which are required for the uniqueness of the current source-function. Dissert. Abstr.

N77-13282 Texas Univ., Austin.
REFLECTION AND TRANSMISSION OF STEADY STATE WAVES AT A MATERIAL INTERFACE BETWEEN TWO WAVEGUIDES Ph.D. Thesis
Alan Lane Sorensen 1976 113 p
Avail: Univ. Microfilms Order No. 76-26707

A boundary minimization and a variational method are developed for modal superposition solutions of semi-infinite elastic waveguides subjected to time harmonic boundary conditions. These results are then extended to obtain solutions for the reflection and transmission of steady state waves at a material interface between a homogeneous half-space and a laminated half-space. The boundary minimization method yielded a satisfactory match of the interface displacement and stress boundary conditions, although the rate of convergence was very slow. The interface solutions are seen to diverge when the variational procedure is used. Dissert. Abstr.

N77-13283 Ohio State Univ., Columbus.
ANALYSIS OF AIRCRAFT WING-MOUNTED ANTENNA PATTERNS Ph.D. Thesis
Ronald Joseph Marhefka 1976 216 p
Avail: Univ. Microfilms Order No. 76-24644

High frequency radiation patterns of aircraft wing mounted antennas were analyzed. Basic antenna types were studied using ray optical techniques. The aircraft was modeled in its most basic form so that the study would be applicable to general-type aircraft. The fuselage was modeled as a perfectly conducting finite elliptic cylinder. The wings and horizontal and vertical

stabilizers were modeled as perfectly conducting n sides flat plates that could be arbitrarily attached to the fuselage or to themselves. The antenna locations were assumed to be on the surfaces of the wings at locations removed from engines and stores such that these effects are negligible. Volumetric patterns were calculated for several aircraft. The validity of the solution was shown by comparing the results against scale model measurements. The application of this solution to practical airborne antenna problems demonstrated its versatility in designing antennas and predicting their radiation patterns in an accurate and efficient manner. Dissert. Abstr.

N77-13284 Ohio State Univ., Columbus.
THE TRANSIENT RESPONSE OF ADAPTIVE ARRAYS IN TDMA SYSTEMS Ph.D. Thesis
Thomas William Miller 1976 320 p
Avail: Univ. Microfilms Order No. 76-24653

The performance which can be obtained by utilizing adaptive arrays to suppress undesired signals in coded communications was investigated. Emphasis was placed on determining the factors which limit the rate at which the array can respond to a time-varying signal environment, e.g., the environment which exists in a time-division multiple access (TDMA) communication system. The performance of adaptive arrays implemented with the LMS algorithm was evaluated analytically and experimentally. The direct matrix inversion algorithm was also investigated analytically to compare LMS algorithm response with the response obtained when estimates of the input signal parameters required to implement an optimal array processor are used in a direct manner to calculate the adaptive array weights. Dissert. Abstr.

N77-13285 Drexel Univ., Philadelphia, Pa.
DECONVOLUTION OF STOCHASTIC SIGNALS Ph.D. Thesis
Louis Robert Cerrato 1976 154 p
Avail: Univ. Microfilms Order No. 76-24486

The problem of separating or deconvolving two signals which have been combined through convolution is considered. Digital algorithms are presented for deconvolving a deterministic signal and a signal which is a sample function from either a stationary or cyclostationary random process. Only weak apriori assumptions about the signals are required to implement the algorithms. The deterministic signal is assumed to be the impulse response of a linear, time-invariant system which is unknown and subject only to a constraint on its temporal duration. The stochastic signal is also unknown, but the statistics of the random process which generated it are available. For both of the algorithms presented the log magnitude and phase portions of the unknown system function are estimated first and then inverse filtering is used to estimate the stochastic signal. Dissert. Abstr.

N77-13286+ Tekelec-Airtronic, Boulogne S/Seine (France).
EQUIPMENT FOR MEASURING NOISE FACTOR AND TEMPERATURE Final Report [ETUDE ET MISE AU POINT D'UN ENSEMBLE DE MESURE DE FACTEUR ET DE TEMPERATURE DE BRUIT]
Jerome GriffonduBellay Jun. 1975 38 p refs In FRENCH
(Contract DGRST-73-7-1616)
(CTB/0892/75/425/BL) Avail: NTIS HC A03

A new method is presented for measuring microwave receiver noise based on purely digital techniques. Tests conducted with the equipment using the method have shown its feasibility but its characteristics remain below those of conventional analog equipment at the same price level. An analog noise factor meter which includes a numerical display circuit was then developed. Noise sources in solid state circuits were investigated, leading to the realization of two narrow-band noise sources using the same avalanche diodes. ESA

N77-13287# National Aviation Facilities Experimental Center, Atlantic City, N.J.
TEST AND EVALUATION OF A PHOTOTYPE VHF LOW-INTERMODULATION AMPLIFIER Interim Report, Jan. - Dec. 1975
James J. Coyle Sep. 1976 12 p
(AD-A029848/9; FAA-NA-76-8; FAA-RD-76-119) Avail: NTIS HC A02/MF A01 CSCL 17/2

The test and evaluation of a prototype very high frequency (VHF) low-intermodulation amplifier that was designed as a frequency-independent interference rejection circuit- for the T-1108/GRT-21 air/ground communication transmitter is described. The amplifier was developed for the Federal Aviation Administration through an interagency agreement with the United States Air Force. The amplifier was tested in the Experimental Peripheral Communications Laboratory at the National Aviation Facilities Experimental Center. Test results showed the amplifier could reduce T-1108/GRT-21 transmitter third-order intermodulation products at least 48 dB when aligned for a single interfering frequency condition, but the amplifier did not achieve the desired 15-dB intermodulation reduction when aligned for broadband interference cancellation across the 118-136 MHz VHF air/ground communication frequency band. Author

N77-13288*# Axiomatix, Marina del Rey, Calif.
DIGITAL TELEVISION SYSTEM DESIGN STUDY Final Report
Gaylord K. Huth 28 Nov. 1976 165 p refs
(Contract NAS9-14863)
(NASA-CR-151125; R7611-3) Avail: NTIS HC A08/MF A01 CSCL 17B

The use of digital techniques for transmission of pictorial data is discussed for multi-frame images (television). Video signals are processed in a manner which includes quantization and coding such that they are separable from the noise introduced into the channel. The performance of digital television systems is determined by the nature of the processing techniques (i.e., whether the video signal itself or, instead, something related to the video signal is quantized and coded) and to the quantization and coding schemes employed. Author

N77-13289# Mitre Corp., Atlantic City, N.J.
PERFORMANCE OF A CORRELATION-SENSITIVE RADAR DETECTION TECHNIQUE Final Report
Robert E. Lefferts May 1976 262 p refs
(Contract DOT-FA69NS-162)
(AD-A030155/6; MTR-7202; FAA-RD-76-133) Avail: NTIS HC $9.00/MF A01 CSCL 17/9

The double threshold method of automatic radar target detection is used in the common digitizer to detect targets in the search radar video. While the performance of this method is acceptable in clear areas, the number of false alarms in weather clutter was found to be excessive. A modification which results in an increased capability to discriminate between weather clutter and aircraft targets is suggested. The modification is an adaptive procedure for adjusting the second threshold level based on both the probability of the first threshold output and the azimuthal correlation between adjacent sweeps. Correlation in weather clutter was identified as the prime cause for the failure of the present method to yield a constant false alarm rate. The probability and correlation of the first threshold output are estimated by counting the number of hits and the number of sequential pairs of hits in azimuth in a moving zone surrounding the cell of interest. Simulation results, using recorded radar data, indicate that false alarm reductions on the order of 40% to 50% can be achieved with no significant loss in detection. Slight gains in detection can be achieved for smaller reductions. Author

N77-13290# Computer Sciences Corp., Falls Church, Va.
SYSTEM DESIGN STUDY FOR VHF UNIVERSAL DATA LINK AND DATA LINK/DABS COMBINATIONS Final Report
Howard A. Blank Feb. 1976 331 p
(Contract DOT-FA72WA-3072)
(AD-A029547/7; FAA-RD-76-13) Avail: NTIS HC A15/MF A01 CSCL 17/2

A preliminary design of a VHF universal data link system is presented. Included are estimates of the design of the judicious selection of appropriate combinations of VHF data link and a discrete address beacon system (DABS). Results indicate that a VHF data universal data link system will greatly upgrade the capabilities of the current air/ground communication system. The implementation cost and complexity appear favorable when compared to the increased communications benefits. Author

N77-13291# Technische Universitaet, Munich (West Germany). Inst. fuer Datenverarbeitung.
SPEECH SIGNAL PROCESSING Final Report

Klaus Centmayer, Erwin Paulus, and Thomas Schotola Bonn Bundesmin. fuer Forsch. u. Technol. Jun. 1976 108 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-04) Avail: NTIS HC A06/MF A01; ZLDI, Munich DM 22,50

Several tests were carried out to identify synthetic vowel sounds in isolated form and in natural word context. Clear shifting of phoneme limits was shown for three different phoneme transitions, precluding the direct allocation of sounds to certain German phonemes. A method is also discussed for automatic speech recognition based on recognition of syllables as an intermediate step. Decision units were developed based on this method. For individual titles, see N77-13292 through N77-13293.

N77-13292 Technische Universitaet, Munich (West Germany).
RELATION BETWEEN SPEECH CONTEXT AND VOWEL PERCEPTION [BEZIEHUNGEN ZWISCHEN SPRACHLICHEM KONTEXT UND VOKALWAHRNEHMUNG]
Klaus Centmayer *In its* Speech Signal Process. Jun. 1976 p 9-82 refs In GERMAN (For primary document see N77-13291 04-32)

Several tests were carried out to identify synthetic vowel sounds, in isolated form and in natural word context. Clear shifting of phoneme limits was shown for three different phoneme transitions. The examples lead to the conclusion that the general procedure of vowel perception, and the allocation of the sound event to a certain German phoneme, is not determined by a rigid classification scheme. Similar shift of phoneme limits may be expected for consonants. A complicated dynamic adaptation will be necessary for an automatic speech recognition system, if speakers are to use all freedoms of natural speech. ESA

N77-13293 Technische Universitaet, Munich (West Germany).
CONSONANT AND VOWEL SEQUENCES AS DECISION UNITS FOR AUTOMATIC SPEECH RECOGNITION [KONSONANTEN- UND VOKALFOLGEN ALS ENTSCHEIDUNGSEINHEITEN FUER DIE AUTOMATISCHE SPRACHERKENNUNG]
Thomas Schotola *In its* Speech Signal Processing Jun. 1976 p 83-105 refs In GERMAN (For primary document see N77-13291 04-32)

A method is discussed for automatic speech recognition based on the recognition of syllables as an essential intermediate step. The vowelled syllable core is thereby separated from its consonantal beginning and end. These parts are then used as decision units in automatic speech recognition. Since the vowelled core can be easily recognized, tests were preferably made on beginning and ends of syllables. A very general recognition method was used, based on a definition of a similarity measure between speech signals and the classification of an unknown signal by comparison with a sufficiently larger set of known reference signals. ESA

N77-13294# Royal Signals and Radar Establishment, Christchurch (England).
EXPERIMENTAL IMPLEMENTATION OF A FORMAT D MESSAGE ANALYSER BY SYNTACTIC SPECIFICATION
J. S. Hill Apr. 1976 46 p refs
(RSRE-76004; BR52596) Avail: NTIS HC A03/MF A01; HMSO; PHI

A syntactic specification was produced for the military message format FORMAT D. A syntactic specification for the analysis of messages in FORMAT D was derived from this; the analysis specification permits tolerance of some typing and simple format errors. SEMSID, a syntax analyzer generator program, was used to produce a working message analysis package from the syntax for message analysis. Introductory sections give a background description of syntactic techniques and tools as used for the task. Author (ESA)

N77-13295# Royal Aircraft Establishment, Farnborough (England).
A STUDY OF CONVOLUTIONAL CODING FOR HIGH FREQUENCY DATA TRANSMISSION
L. J. Richards Apr. 1976 17 p refs
(RAE-TM-Math-7601; BR52598) Avail: NTIS HC A02/MF A01

An introduction to convolutional coding is given and the process of threshold decoding is illustrated. The error characteristics of the VHF channel are briefly discussed and several coding methods are described. Particular attention is paid to families of diffuse and interleaved rate 2/3 codes and the results of computer simulations are presented. The comparative advantages of block coding and convolutional coding are described. Author (ESA)

N77-13296# Rohde and Schwartz, Munich (West Germany). Abteilung Mikroelektronik.
DEVELOPMENT OF FUNCTIONAL MICROSTRIP COMPONENTS Final Report
Gerhard Haupt, Helmut Paster, Max Rieberer-Murer, Wolfgang Weidmann (Tech. Univ. Munich), and Hans Delfs Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 104 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-28) Avail: NTIS HC A06/MF A01; ZLDI, Munich, DM 21.45

Variations of the dielectric constant and the thickness of aluminum oxide substrates were studied by measuring capacitance values. Resonance frequencies were measured to study quasilumped inductances and capacitances, inhomogeneities of strip lines, circular resonators, directional couplers, and slot lines. A simple method was developed for the design of directional couplers having an increased directivity. The favorable properties of a slot line used as symmetrical transformer were used in the design of a mixer. Author (ESA)

N77-13297# Battelle Inst., Frankfurt am Main (West Germany).
DEVELOPMENT AND MODULATION OF A SMALL LIGHTWEIGHT STABILIZED CO2-LASER: EVALUATION OF POSSIBLE MODULATION TECHNIQUES AND SELECTION OF THE MOST SUITABLE METHOD
Wolfgang R. Englisch Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1976 122 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-RFT-2070; GfW-RV-11-06/23/70)
(BMFT-FB-W-76-06) Avail: NTIS HC A06/MF A01: ZLDI, Munich, DM 25,20

Based on comprehensive theoretical and experimental investigations a breadboard model of a CO2 laser space communication system with an information bandwidth of 150 MHz was developed. Modulation of laser light was achieved by means of the coupling modulation technique using the electrooptic effect in GaAs. With this modulation technique no basic upper limit in bandwidth exists; modulation voltage and power are very low. The video signals of two TV cameras (together with the sound signals), both modulated on VHF carriers, were transmitted simultaneously over a test range (2 km) between the Battelle Institute and the Frankfurt University Observatory. The system exhibited a very good transmission quality even at an HF modulation voltage level of less than 3 V. Author (ESA)

N77-13298# Institut Franco-Allemand de Recherches, St. Louis (France).
RADIO FREQUENCY ELECTROMAGNETIC RADIATION EFFECTS OF DETONATING CHEMICAL EXPLOSIVE CHARGES [RADIOFREQUENTE ELEKTROMAGNETISCHE STRAHLUNGSEFFEKTE DETONIERENDER CHEMISCHER SPRENGLADUNGEN]
B. Koch and H. Haensel Bonn DOKZENTBw 1976 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-76-1) Avail: NTIS HC A03/MF A01; DOKZENTBw DM 30

Quantitative results of systematic and extensive measurements are presented concerning the energy and peak power of radiofrequency electromagnetic pulses generated by the detonation of shells of different calibers and shapes in addition to simulator charges of different sizes and metallic case materials. Only chemical explosives were used. Simultaneous recordings at five wavelengths in the band between 0.4 and 2.8 m were made using a high gain directional antenna connected to calibrated linear test receivers. Results are discussed and will provide the fundamental basis for a physical explanation of the phenomenon. ESA

N77-13299# Science Applications, Inc., Berkeley, Calif.
STATISTICAL ANALYSIS OF CRITICAL LOAD EXCITATIONS INDUCED ON A RANDOM CABLE SYSTEM BY AN INCIDENT DRIVING FIELD: BASIC CONCEPTS AND METHODOLOGY Final Report
M. A. Morgan and F. M. Tesche Kirtland AFB, N. Mex. AFWL May 1976 19 p refs
(Contract F29601-75-C-0112; AF Proj. 1209)
(AD-A024840; AFWL-TR-75-281) Avail: NTIS HC A02/MF A01 CSCL 20/3

Electromagnetic pulse internal interaction analysis is complicated by the presence of many seemingly random parameters which preclude the strictly deterministic solution for induced excitations at particular load points. This report briefly discusses a possible technique for the statistical analysis of load excitations on an unshielded N-wire random cable illuminated by an incident time-harmonic field using the reciprocity theorem in conjunction with subset representation of a statistical ensemble.
Author (GRA)

N77-13300# Marine Corps Development and Education Command, Quantico, Va. Development Center.
LANDING FORCE INTEGRATED COMMUNICATIONS SYSTEM ARCHITECTURE, 1976 - 1990
Barry N. Bittner Apr. 1976 289 p
(AD-A025855; CC-09-1-02-6) Avail: NTIS HC A13/MF A01 CSCL 17/2

This document sets forth the USMC Landing Force Integrated Communications System (LFICS) Architecture for the years 1976 through 1990. The architecture is a system plan which will be used as a guide in the future development of Marine Corps tactical communication equipment over the next fifteen years. This document will be updated annually in April. Author (GRA)

N77-13301# Naval Ship Research and Development Center, Bethesda, Md.
DEAS INFORMATION NETWORKS STUDY. PHASE 1: CURRENT SHIP-SHORE INFORMATION TRANSFER DESCRIPTION Interim Report
Benjamin Siegel and Curtis Ash Jun. 1975 183 p refs
(AD-A024996; DTNSRDC-4704) Avail: NTIS HC A09/MF A01 CSCL 17/2

The purpose of Data Entry Aboard Ship (DEAS) Information Networks Study is to describe and analyze shipboard (destroyer) communication resources, the extent and characteristics of logistics information to be transferred, and the physical means (information network) by which it is to be transferred. The ultimate objectives are to assure compatibility between DEAS-equipped ships and either current or proposed information handling equipment and systems in port and at sea, and to propose methods of reducing the use of manpower, money, and time within ship-related logistics information networks. The DEAS Information Networks Study is being performed in three phases. This Phase 1 report describes the information handling functions performed by the nodes and links of these networks. GRA

N77-13302# Science Applications, Inc., La Jolla, Calif.
PROPAGATION EFFECTS OF LARGE PHASE VARIATIONS IN A STRIATED PLASMA Topical Report, 1 Oct. 1974 - 31 Oct. 1975
David L. Sachs 12 Nov. 1975 59 p refs
(Contract DNA001-75-C-0033; DNA Proj. NWED-QAXHB054)
(AD-A024997; SAI-75-679-LJ; DNA-3852T) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report describes the amplitude scintillation and frequency coherence of a radio signal that has passed through striated plasma. The plasma is modeled as a random collection of Gaussian cylinders of electron density with a range of characteristics sizes. It is shown that the largest effects occur when the receiver is in the vicinity of a focal region of the striations. It is also shown that ray theory including caustics is insufficient for the treatment of general striation structure. Author (GRA)

N77-13303# Harris Corp., Melbourne, Fla. Electronic Systems Div.
BROADBAND DIGITAL MODEM Final Report, 13 May 1974 - 13 Nov. 1975
Thomas R. Losson Griffiss AFB, N. Y. RADC May 1976 165 p refs
(Contract F30602-74-C-0263)
(AD-A025399; RADC-TR-76-117) Avail: NTIS HC A08/MF A01 CSCL 17/2

The objective of this program was to develop a practical modem technique providing the means to trunk a large volume of digitized voice channels within the present FDM-FM bandwidth allocations. Specifically, a bandwidth efficiency of 2 bits per hertz of RF bandwidth and a bit error of 10 to the 7th power or less at an E sub b/N sub o of 20 db were desired. These characteristics, provided in conjunction with hard-limiting radio sets, allow efficient conversion of analog FDM-FM line-of-sight microwave systems to digital operation by replacement of the modulation elements. It was determined that 4-ary FSK was the best signal design, given the performance objectives and the constant-envelope constraint. A continuous-phase, coherent detection, multisymbol observation modem was constructed and successfully tested. The performance objective of a 10 to the 7th power bit error rate at an E sub b/N sub o of 20 db was bettered by approximately 0.5 db in laboratory tests. GRA

N77-13304# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE ROLE OF COMMUNICATION SATELLITES IN EDUCATION FOR LESS-DEVELOPED COUNTRIES M.S. Thesis
David Earl Hughes Oct. 1975 134 p refs
(AD-A025397; AFIT-CI-76-29) Avail: NTIS HC A07/MF A01 CSCL 17/2

The purpose of the study is to place the potentials and problems associated with communication satellites and educational television into perspective with the social, political, and economic resistance which often hinder the utilization of technological advancements. The study examines the need for an educational broadcasting satellite system in detail. GRA

N77-13305# Michigan Univ., Ann Arbor. Radiation Lab.
SWEEP FREQUENCY SURFACE FIELD MEASUREMENTS Final Report
Valdis V. Liepa Apr. 1976 79 p
(Contract F29601-75-C-0035; AF Proj. 1209)
(AD-A024851; AFWL-TR-75-217) Avail: NTIS HC A04/MF A01 CSCL 20/14

The research described in this report is primarily experimental and deals with the development of surface current and charge measurement techniques for use on scale model aircraft. The report describes a sweep measurement technique where measurements are made by sweeping a frequency with the sensor fixed and positioned in turn at selected measurement points of interest. Design and performance data of a number of current and charge sensors are presented, including the diode sensors that use high resistance telemetry leads for reduced interaction with the model and the incident field. GRA

N77-13306# Illinois Univ., Urbana.
ANALYSIS OF MODES IN A FINITE-WIDTH PARALLEL-PLATE WAVEGUIDE Final Report
T. Itoh and R. Mittra Apr. 1976 26 p refs
(Contract F29601-74-C-0010; AF Proj. 3763)
(AD-A024839; AFWL-TR-75-83) Avail: NTIS HC A02/MF A01 CSCL 09/5

An efficient method has been developed for analyzing modal characteristics of a finite-width parallel-plate waveguide. The method is based on an extension of Galerkin's procedure applied in the Fourier transform domain. Numerical values of propagation constants and field distributions have been obtained for various structural and modal parameters. Author (GRA)

N77-13307# GTE Sylvania, Inc., Needham Heights, Mass. Communications Systems Div.
ELF COMMUNICATIONS SEAFARER PROGRAM, SITE SURVEY, WESTERN REGIONS. BOOK 1: SUMMARY Final Summary Report
22 Dec. 1975 164 p ref
(Contract N00039-75-C-0309)
(AD-A024796) Avail: NTIS HC A08/MF A01 CSCL 17/2

The report presents the results of a survey conducted at two candidate sites in the Southwest for installation of the SEAFARER system. The survey was performed for two primary

purposes: to provide information required for preparation of a draft Environmental Impact Statement (EIS); and to provide the engineering data necessary to adapt the conceptual SEAFARER design to the physical characteristics of the two locations. GRA

N77-13308# GTE Sylvania, Inc., Needham Heights, Mass. Communications Systems Div.
ELF COMMUNICATIONS SEAFARER PROGRAM, SITE SURVEY, WESTERN REGIONS. BOOK 4: ANTENNA CONSTRUCTION COST FACTORS AND INSTALLATION PLAN Final Report
17 Nov. 1975 131 p Prepared in cooperation with Henkels and McCoy, Inc.
(Contract N00039-75-C-0309)
(AD-A024799) Avail: NTIS HC A07/MF A01 CSCL 17/2

The report documents a study of the methods and costs associated with the installation of the underground antenna cable portion of the Seafarer Project. The study included the proposed installation sites of Nellis in Nevada including Tonopah Test Range, Nellis Bombing Range and the Nevada Test Site, and White Sands in New Mexico including the White Sands Missile Range and Fort Bliss. GRA

N77-13309# GTE Sylvania, Inc., Needham Heights, Mass. Communications Systems Div.
ELF COMMUNICATIONS SEAFARER PROGRAM, SITE SURVEY, WESTERN REGIONS. BOOK 5: EARTH CONDUCTIVITY DATA Final Report
22 Dec. 1975 104 p refs
(Contract N00039-75-C-0309)
(AD-A024797) Avail: NTIS HC A06/MF A01 CSCL 17/2

The report presents earth conductivity data collected in Nevada and New Mexico, and verified in Wisconsin, with the resulting interpretations necessary to the selection of an appropriate site for the installation of the SEAFARER system. GRA

N77-13310# GTE Sylvania, Inc., Needham Heights, Mass. Communications Systems Div.
ELF COMMUNICATIONS SEAFARER PROGRAM, SITE SURVEY, WESTERN REGIONS. BOOK 6: MISSION COMPATIBILITY DATA Final Report
22 Dec. 1975 48 p
(Contract N00039-75-C-0309)
(AD-A024808) Avail: NTIS HC A03/MF A01 CSCL 17/2

The report presents the results of an assessment of the impact of SEAFARER on the assigned missions of the present users of the Nellis Air Force Range and the Nevada Test Site in Southern Nevada, and the White Sands Missile Range and Fort Bliss in Southern New Mexico. GRA

N77-13311# Polar Research Lab., Inc., Santa Barbara, Calif.
ARCTIC RESEARCH IN ENVIRONMENTAL ACOUSTICS (AREA) TECHNICAL REPORT NO. 2: PRELIMINARY RADIO PERFORMANCE PREDICTIONS FOR THE ARCTIC ENVIRONMENTAL BUOY (AEB) Interim Report
Beaumont M. Buck 7 Jun. 1976 36 p
(Contract N00014-74-C-0065; NR Proj. 307-355)
(AD-A026552; PRL-TR-5) HC A03/MF A01 CSCL 08/10

Consideration is being given to adapting the high-frequency Arctic Environmental Buoy (AEB) originally developed for the Arctic Ice Dynamics Joint Experiment (AIDJEX), to a new concept for long-term, wide-area environmental data collection in the Arctic Ocean. The AEB was originally applied to a small area; under this new concept a number of small, widely dispersed drifting stations will be established on pack ice. The concept is called 'Manned-UnManned Multipurpose Environmental Research Station' (MUMMERS). Each station is equipped for short manned experiments and, when unmanned, automatically collects and relays synoptic oceanographic, meteorological, and geophysical environmental data to shore stations via the AEB's HF telemetry. A preliminary study was made of the expected performance of the AEB's HF link to determine its overall feasibility and to identify those AEB modifications and shore receiving sites needed to optimize performance. It was concluded that the addition of 8 MHz to the original 4 MHz would be a feasible AEB modification which would probably offer satisfactory performance during all seasons over most of the Arctic Ocean if two receiving sites located at Barrow, Alaska and Alert, Canada were used. GRA

N77-13312# Lincoln Lab., Mass. Inst. of Tech., Lexington.
KALMAN FILTER CONFIGURATIONS FOR MULTIPLE RADAR SYSTEMS
Dieter Willner, Chaw-Bing Chang, and Keh-Ping Dunn 14 Apr. 1976 61 p refs
(Contract F19628-76-C-0002; DA Proj. 8X3-63304-D-215)
(AD-A026367; TN-1976-21; ESD-TR-76-79) Avail: NTIS HC A04/MF A01 CSCL 17/9

The purpose of this report is to examine several Kalman filter algorithms that can be used for state estimation with a multiple sensor system. These algorithms are described in detail and their results are compared with a suboptimum tracking algorithm which processes only multiple range measurements. A state estimate compression algorithm is also described. Various radar measurement transformation formulas are listed. Algorithms for a nonsynchronous data collection system are not examined in detail but possible approaches are suggested. Author (GRA)

N77-13313# Army Materials and Mechanics Research Center, Watertown, Mass.
HARDENED TUNED-WALL PLASTIC RADOMES FOR MILITARY RADARS
Joseph J. Prifti, Eugenio DeLuca, and Anthony L. Alesi 1976 15 p
(AD-A026146) Avail: NTIS HC A02/MF A01 CSCL 17/9

XP (stretched polypropylene) film is perhaps the most effective material for construction of hardened dielectric walls. It has excellent fragment-defeat properties, a low relative dielectric constant (2.3) and a very low loss tangent (0.005). For low-loss materials, reflection losses are determined by the dielectric constant and absorption losses by the loss tangent. A perfect radome material would have a dielectric constant of one and a loss tangent of zero. Additionally, XP is self bonding under heat and pressure, allowing construction of homogeneous, tuned-wall design. The wall thickness is chosen to be an integral number of half wavelengths in the material to take advantage of cancelling out reflections at the inner wall; loss in beam intensity is then mainly due to absorption in the wall. (1) The resulting thick-wall radome allows efficient r-f transmission and provides a high level of ballistic protection against fragmentation munitions. The AN/TPQ-37 is the first radar antenna considered for hardening against fragment munitions attack. GRA

N77-13314# RAND Corp., Washington, D.C.
SPECTRUM CONSERVATION BY EFFICIENT CHANNEL UTILIZATION
Edward Bedrosian Jan. 1976 42 p refs
(AD-A026668; P-5579) Avail: NTIS HC A03/MF A01 CSCL 09/4

The growth of the communication industry and its ever-increasing demands on the radio spectrum has spurred the exploitation of previously unused frequency bands and the development of techniques for making better use of those already available. In this paper, spectral utilization is examined using the information-theory techniques of Shannon. The power-bandwidth tradeoff for the ideal channel is established and the performance of practical analog and digital modulation techniques is compared with this ideal. It is shown that well designed systems tend to operate near the 'knee' of the power-bandwidth tradeoff curve for the ideal channel and that they are frequently within 10 dB or less of the performance of the ideal. Author (GRA)

N77-13239# Technische Hochschule, Graz (Austria). Inst. fuer Nachrichtentechnik und Wellenausbreitung.
THE NEED FOR MICROWAVE PROPAGATION RESEARCH
W. Riedler *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 1-6 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13240# Rome Univ. (Italy).
COMMUNICATION REQUIREMENTS FOR TERRESTRIAL AND SPACE RADIO-LINKS AT FREQUENCIES ABOVE 10 GHz
B. Peroni *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 7-14 (For primary document see

N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13241# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Atmosphaerenphysik.
RAINDROP AND HAILSTONE SPECTRA FROM SEVERE STORMS
A. Waldvogel *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 15-24 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13243# European Space Research and Technology Center, Noordwijk (Netherlands).
A NEW THEORY ON RAINDROP CANTING AND ITS APPLICATION TO MICROWAVE CROSS-POLARISATION STUDIES
G. Brussaard *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 33-41 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13244# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
THEORETICAL AND EXPERIMENTAL DETERMINATION OF RAIN ATTENUATION ON A RADIOELECTRIC LINK RADIO PATH [DETERMINATION THEORIQUE ET EXPERIMENTALE DE L'AFFAIBLISSEMENT PAR LA PLUIE SUR UN TRAJET RADIOELECTRIQUE]
P. Misme and J. Fimbel *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 43-59 refs In FRENCH (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13245# Post Telefon und Telegrafen Betriebe, Bern (Switzerland). Abteilung Forschung und Entwicklung.
PROBABILITIES OF THE OCCURRENCE OF RAIN CELLS AND RAIN ATTENUATION
W. E. Debrunner *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 61-71 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13246# European Space Research and Technology Center, Noordwijk (Netherlands).
NEEDS FOR PROPAGATION RESEARCH IN VIEW OF THE EUROPEAN COMMUNICATION SATELLITES PROGRAMME
R. Martinon *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 73-83 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13247# Politecnico di Milano (Italy).
OPPORTUNITIES OFFERED BY THE SIRIO SATELLITE FOR PROPAGATION RESEARCH
F. Carassa *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 85-92 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13248# Post Office Research Dept., Ipswich (England).
SATELLITE PROPAGATION AND INTERFERENCE EXPERIMENTS AT THE UK POST OFFICE RESEARCH CENTER
J. Thirlwell *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 93-102 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13250# Post Telefon und Telegrafen Betriebe, Bern (Switzerland). Abteilung Forschung und Entwicklung.
MEASUREMENT OF ATTENUATION AND CIRCULAR CROSS-POLARISATION DISCRIMINATION AT 13 GHz ON A SLANT PATH
C. H. Zufferey *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 113-120 refs (For primary document see N77-13238 04-31)
(Contract ESRO-1672/72-SW)
Avail: NTIS HC A13/MF A01

N77-13251# Telespazio, S.p.A., Rome (Italy).
ATTENUATION AND DEPOLARISATION MEASUREMENTS ON AN INCLINED PATH AT 11 GHz
G. Possenti *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 121-128 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13252# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
INTRODUCTION TO THE EQUIVALENT DISTANCE IN THE CALCULATION OF OBLIQUE PATH ATTENUATION: APPLICATION TO A 20 GHz RADIOMETRIC MEASUREMENT [INTRODUCTION DE LA NOTION DE DISTANCE EQUIVALENTE DANS LE CALCUL DES AFFAIBLISSEMENTS SUR UNE LIAISON OBLIQUE: APPLICATION A UNE MESURE RADIOMETRIQUE A 20 GHz]
J. Fimbel and P. Misme *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 129-134 refs In FRENCH (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13253# AEG-Telefunken, Backnang (West Germany).
AUTOMATIC COMPENSATION OF CROSS-POLARISATION COUPLING IN COMMUNICATION SYSTEMS USING ORTHOGONAL POLARISATIONS
H. Kannowade *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 135-146 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13255# Helsinki Univ. of Technology, Otaniemi (Finland).
EXPERIMENTS PERFORMED AT THE RADOME COVERED GROUND STATION IN FINLAND
H. Sandell *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 159-164 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13256# Fondazione Ugo Bordoni, Rome (Italy).
EUROPEAN RESEARCH ACTIVITIES ON RADIO-WAVE PROPAGATION ABOVE 10 GHz IN THE FRAMEWORK OF COST
F. Fedi *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 165-178 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13257# Essex Univ., Colchester (England).
CROSS-POLARISATION MEASUREMENTS AT 11 AND 22 GHz IN EASTERN ENGLAND
B. G. Evans, P. T. Thompson (Post Office Res. Dept., Ipswich, Engl.), and D. J. W. Turner (Post Office Res. Dept., Ipswich, Engl.) *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 179-196 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13258# Posterijen, Telegrafie en Telefonie, The Hague (Netherlands). Dr. Neher Lab.
AN EXPERIMENTAL RADIO LINK FOR THE INVESTIGATION OF THE DEPOLARISATION OF HORIZONTAL AND VERTICAL POLARISED SIGNALS AT A FREQUENCY OF 11.5 GHz
M. A. Reinders and J. F. Spee *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 197-205 (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13259# Technische Hogeschool, Eindhoven (Netherlands).
THE ANALYSIS OF THE PROPAGATION DATA OF THE LINE-OF-SIGHT MICROWAVE LINK GUNUNG SANDAGAN - SURABAYA (INDONESIA) FOR THE WET SEASON
J. Neessen *In* ESA Probl. of Space and Terrest. Microwave

Propagation May 1976 p 207-215 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13260# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
EXPERIMENTAL INVESTIGATION OF A LINK AT 13 GHz ON 53 km: ATTENUATION AND CROSS POLARIZATION [ETUDE EXPERIMENTALE D'UNE LIAISON A 13 GHz SUR 53 km: AFFAIBLISSEMENT ET DECOUPLAGE DE POLARISATION]
M. Rooryck and J. Battesti *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 217-227 refs In FRENCH (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13261# Universite Catholique de Louvain (Belgium).
DEPOLARISATION AND DOUBLE POLARISATION RADIOMETRY AT 12 GHz: THEORETICAL AND EXPERIMENTAL RESULTS
P. Delogne, M. Lobelle, P. Sobieski, and J. vanVyve *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 229-239 refs (For primary document see N77-13238 04-31) (Contracts ESTEC-1997/73-MD; ESTEC-2014/73-MD)
Avail: NTIS HC A13/MF A01

N77-13262# Universite Catholique de Louvain (Belgium).
DATA ACQUISITION AND HANDLING OF THE LOUVAIN-LA-NEUVE EXPERIMENTS
E. Gaudissart, A. Laloux, and C. deWinter *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 241-247 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13263# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.
THE 13.5 TO 15.0 GHz SWEEP AMPLITUDE AND PHASE PROPAGATION MEASUREMENTS
E. Lintz Christensen *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 249-256 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13264# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.
ANALYSIS OF 13.5 TO 15 GHz AMPLITUDE AND PHASE PROPAGATION DATA
G. Mogensen *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 257-263 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

N77-13265# Finnish Administration of Posts and Telegraphs, Helsinki. Radio Div.
RAIN ATTENUATION MEASUREMENT WITH AN OPEN RESONATOR
T. Haikonen *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 265-267 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N77-13315* National Aeronautics and Space Administration. Pasadena Office, Calif.
FREQUENCY DISCRIMINATOR AND PHASE DETECTOR CIRCUIT Patent
Robert Bruce Crow, inventor (to NASA) (JPL) Issued 31 Jul. 1973 10 p Filed 3 May 1971 Sponsored by NASA (NASA-Case-NPO-11515-1; US-Patent-3,750,035; US-Patent-Appl-SN-139596; US-Patent-Class-328-133; US-Patent-Class-307-295; US-Patent-Class-307-233) Avail: US Patent Office CSCL 09A

Frequency discriminator and phase detector circuits are disclosed, each having two flip-flops, one flip-flop for each of two signals to be compared. Means are provided for causing one flip-flop to be set the majority of the time in proportion to the extent to which one signal differs from the other in frequency or phase. A method is also provided for integrating the difference between output waveforms of the flip-flops to obtain an output signal which can be used to adjust the frequency of phase of a variable signal with respect to a reference signal. NASA

N77-13316 Illinois Univ., Urbana-Champaign.
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF MULTIPLE REACTIONS IN A TUBULAR ELECTRODE UNDER STEADY LAMINAR FLOW
Ali Asghar Mirarefi 1976 281 p
Avail: Univ. Microfilms Order No. 76-24141

The electrode consisted of a sectioned copper electrode in which the sections were electrically insulated from each other by placing thin rings between each two of them. The electrolytic solution flowed in a fully developed, steady laminar motion through the electrode. Experiments were conducted when the electrolyte contained cupric ion, cupric and ferric ions, and ferric ion. For the latter case the electrode surface was plated with platinum. The reaction rate distribution for a cathodically polarized electrode was measured directly by using a set of operational amplifiers which introduced no resistance into the circuit. Measurements were performed at several fractions of the limiting current as well as at the limiting current. The configuration of the system was varied in order to determine the effect of counterelectrode placement, tube radius and length, reactant concentration and flow rate. Dissert. Abstr.

N77-13317 Arkansas Univ., Fayetteville.
INVESTIGATION OF AN ECCENTRICITY COMPENSATION SYSTEM FOR SHAFT ANGLE ENCODERS Ph.D. Thesis
Ralph Stanley Hafle 1976 202 p
Avail: Univ. Microfilms Order No. 76-26361

A method of compensating for the errors induced into the electrical signals of optical shaft angle encoders by code disk eccentricity is presented. The details of construction and an examination of the method are provided. A general class of disk patterns is synthesized to facilitate disk pattern design by relating the sinusoidal-shape accuracy to the pattern complexity. An analysis of the interaction of these disk patterns with the stationary light-intensity distributions is given and an optimum condition for systems with a Gaussian light intensity distribution is determined. Several arrangements using rectangular light intensity distributions are identified. The harmonic distortion produced by photodetector nonlinearity is examined. A computer program to compute the harmonic content based on an Ebers-Moll model of the photodetector is included. The sensitivity of the output signal to various adjustment errors is quantitatively examined. Dissert. Abstr.

N77-13318 Stanford Univ., Calif.
ERROR LATENCY IN DIGITAL CIRCUITS
John James Shedletsky 1976 164 p
Avail: Univ. Microfilms Order No. 76-26076

Methods to obtain the value of the distruction parameter and thereby to describe the error latency are given. The error latency models developed provide analytic tools that are particularly suited to the study of: (1.) random testing of a digital circuit; (2.) reliability modeling of a digital circuit; and (3.) program rollback during recovery. The great advantage of this new approach is a surprising conclusion that is easily reached. It is shown that both the signal and function reliability measures lead to performance predictions that are nearly equal under certain broad conditions. Unless these conditions are violated, it makes no difference which reliability measure is used. Dissert. Abstr.

N77-13319 Marquette Univ., Milwaukee, Wis.
AN INVESTIGATION OF THE INFLUENCE OF GRAIN BOUNDARIES ON THE ELECTRICAL BEHAVIOR OF

POLYCRYSTALLINE ZrO2-CaO Ph.D. Thesis
Ssu-Hai Chu 1976 160 p
Avail: Univ. Microfilms Order No. 76-21741

The dielectric behavior of polycrystalline zirconium oxide with calcium concentrations ranging from 12 to 19 mole per cent as investigated as a function of frequency, from 100 Hz to 500 KHz, temperature, from 300 C to 900 C, and partial pressure of oxygen, from 10-5 atm. to 1 atm. Specimens having various grain sizes, electrode materials, and degrees of sintering were also considered in order to determine the influence of grain boundaries on the electrical conduction. The a.c. dielectric data were analyzed with the aid of impedance plotting technique. This allowed an equivalent circuit representation of the specimen. The a.c. impedance of ZRO2-CaO exhibited a general three loop behavior. At high temperatures, space charge polarization due to ionized oxygen vacancies being partially blocked at the specimen electrodes seems responsible for a major portion of the dielectric behavior. Dissert. Abstr.

N77-13320 Stanford Univ., Calif.
PROBABILISTIC TEST GENERATION Ph.D. Thesis
Kenneth Paul Parker 1976 105 p
Avail: Univ. Microfilms Order No. 76-26054

The sensitivity of digital circuitry to the statistical characteristics of the random test generator is explored utilizing a probabilistic model of digital circuitry. It is then demonstrated that test generation efficiency is greatly affected by these characteristics and that they can be controlled to produce better results. Finally, it is shown how to use adaptive feedback to control the random source, producing test generation performances unattainable by purely random test generation procedures. It can be concluded that probabilistic test generation techniques greatly enhance the ability of random test generation procedures to develop test sets for general digital circuits. Further contributions are the adaptive mechanisms for test generation and the models used in the analysis. The probability model of digital circuits has led to additional research in related fields. Dissert. Abstr.

N77-13321 Stanford Univ., Calif.
ANALYSIS OF SHORTS USING THE CHANNEL CHARACTERISTICS OF FIELD-EFFECT TRANSISTORS Ph.D. Thesis
Albert Shihyuan Wang 1976 87 p
Avail: Univ. Microfilms Order No. 76-26088

The phenomenon of enhanced diffusion along a single dislocation in silicon was investigated. A technique was used to treat the shorts between emitter and collector of a bipolar transistor as the channel region of a junction field-effect transistor (FET) so that an analysis of the short could be carried out by using the channel characteristics of the FET. A saddle point model of the electric field distribution in the domain was developed to describe the behavior of both long and short channel effects. By further adapting the theory of enhanced phosphorus diffusion along the dislocation, to establish the doping profile of the channel, the operation of the FET in the linear domain was examined. Based on a set of electrical measurement, the identity of the shorts was established. Dissert. Abstr.

N77-13322 Illinois Univ., Urbana-Champaign.
COMPUTER-AIDED ANALYSIS OF MIXER CIRCUITS Ph.D. Thesis
William Hsia Kao 1976 104 p
Avail: Univ. Microfilms Order No. 76-24112

While great advances were made in numerical algorithms for d.c., a.c., and transient analysis of systems, very little research was done on the development of simulation programs for the steady state analysis of nonlinear communication circuits. This thesis carries out an assessment of computer aided simulation techniques in the analysis of mixer circuits. Problems that are frequently encountered in mixer circuits, some mixer performance criteria, and some design tips are discussed. A survey of various computational techniques for the steady state analysis of nonlinear circuits is also presented. Finally, the program SINC is modified to simulate several mixer circuits and the simulated results are compared to laboratory measurements and the memoryless series approach calculations. Dissert. Abstr.

N77-13323 Detroit Univ., Mich.
VEHICULAR ELECTRICAL SYSTEM TRANSIENTS, THEIR ORIGIN AND CONTROL Ph.D. Thesis
Warren Ray Hill 1975 138 p
Avail: Univ. Microfilms Order No. 76-23785

An equivalent circuit model of the basic vehicular electrical system was developed and analyzed using a general circuit analysis program. Transient analyses are obtained for two different types of transients, the load dump transient caused by sudden removal of the system battery while it is being heavily charged and the transient occurring when system loads are suddenly removed. The analytical results predict the test stand values with an 80 percent confidence level. Various methods of transient protection are analyzed and compared. Two new types of protection circuits are developed and examined in detail. Some criteria for the application of transient protection methods are developed and some recommendations are given concerning the application of appropriate protection schemes. Dissert. Abstr.

N77-13324 Drexel Univ., Philadelphia, Pa.
ASSESSMENT OF POWER SYSTEM SECURITY UNDER LOAD UNCERTAINTY Ph.D. Thesis
Gabriel Chike Ejebe 1976 218 p
Avail: Univ. Microfilms Order No. 76-24225

A method was developed for the assessment of power system steady state security in the presence of load uncertainty. A set-theoretic formulation of the security assessment problem was developed and is based on the complete characterization of the set of operating states - generation levels - for which the system is permanently secure in the presence of uncertainties in the bus load levels. This explicit characterization constitutes a permanently secure region. Dissert. Abstr.

N77-13325 Lignes Telegraphiques et Telephoniques, Conflans-Sainte-Honorine (France). Dept. Hyperfrequence.
CHARACTERIZATION OF DIELECTRIC AND MAGNETIC PROPERTIES OF LIQUID CRYSTALS AT HYPERFREQUENCIES Final Report [CARACTERISATION DES PROPRIETES DIELECTRIQUES ET MAGNETIQUES DES CRISTAUX LIQUIDES EN HYPERFREQUENCE]
B. Chiron and J. Pujhaubert 20 Mar. 1975 163 p refs In FRENCH
(Contract DGRST-73-7-1372)
Avail: Issuing Activity

The dielectric and magnetic properties of liquid crystals were studied for the following applications: electromagnetic hyperfrequent wave visualization for various cases of guided wave propagation and establishment of practical visualization devices with emphasis on the most suitable support for liquid crystals. Cholesteryl pelargonate, cholesteryl propionate, and cholesteryl oleate were found to be the most promising liquid crystal material. The properties of these compounds were studied and the following hyperfrequent devices were investigated: guided transmission lines and microwaves, unidirectional devices, and antennas. It was concluded that the liquid crystal method has reached the industrial development stage. ESA

N77-13326 Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Micro-ondes.
JUNCTION CIRCULATORS Final Report [CIRCULATEURS A JONCTION]
Alain Priou and Lint ChanSong Jan. 1975 70 p In FRENCH
(Contract DGRST-73-7-1378)
(ONERA-CERT-1-1047) Avail: Issuing Activity

A theoretical and experimental study of composite junction circulators was made. The importance of the ferrite-dielectrics association and of the parameter psi to obtain a wideband circulator is demonstrated. Complete computer programs were developed, permitting the characterization of this type of circulators. The computer programs were applied to develop a high performance narrow band circulator and to define circulators with larger operating bands. ESA

N77-13327+ Universite des Sciences et Techniques de Lille (France). Centre Hyperfrequences et Semiconducteurs.
AVALANCHE DIODE PHASE SHIFTERS, MIXERS, CONVERTERS FOR CENTIMETER AND MILLIMETER WAVES

Final Report [DEPHASEURS, MELANGEURS, TRANSPOSEURS A DIODES A AVALANCHE EN ONDES CENTIMETRIQUES ET MILLIMETRIQUES]
J. L. Vaterkowski, E. Constant, and D. Hars Dec. 1974 55 p refs In FRENCH
(Contract DGRST-73-7-1373)
Avail: NTIS HC A04

The application of avalanche diodes as nonlinear elements in phase shifters and mixers for the X-band (8 to 12 GHz) and the Q-band (26 to 40 GHz) was investigated theoretically and experimentally. These diodes are to replace the varactor diodes generally used in microwave circuits. A simplified analytic theory was developed for better understanding of the phenomena associated with the use of avalanche diodes in mixers and phase shifters. Several types of transmission converters or mixers built are described with regard to power performance, conversion efficiency, noise, and linearity in the Q-band. Results obtained during some tests of X-band converters are presented. The feasibility of phase shifters and modulators was studied for this band. ESA

N77-13328+ Centre National de la Recherche Scientifique, Grenoble (France).
ELECTRONIC PROPERTIES OF GLASSY AND AMORPHOUS THIN FILM SEMICONDUCTORS Final Report [ETUDE APPROFONDIE, THEORIQUE ET EXPERIMENTALE SUR LES PROPRIETES ELECTRONIQUES DES SEMICONDUCTEURS AMORPHES ET VITREUX EN COUCHES MINCES]
B. K. Chakraverty Dec. 1974 37 p refs In FRENCH
(Contract DGRST-72-7-0561)
Avail: NTIS HC A03

A theoretical and experimental study was made of amorphous germanium alloys with tellurium or iron. The electrical and optical properties of amorphous Ge-Te films were determined, and a series of ferromagnetic amorphous Ge-Te materials was developed. ESA

N77-13329 Societe Generale de Constructions Electriques et Mecaniques Alsthom, Massy (France). Dept. Semi-Conducteurs.
OPTIMIZATION OF HIGH POWER THYRISTORS BY NUMERICAL CALCULATION Final Report [OPTIMISATION DES THYRISTORS DE GRANDE PUISSANCE PAR CALCUL NUMERIQUE]
S. Lehmann, D. Barge, and G. Vassal 3 Jul. 1975 151 p refs In FRENCH
(Contract DGRST-73-7-1366)
Avail: Issuing Activity

Computer programs were developed for numerical optimization of high power thyristors. A program was defined for determining the structural parameters of a thyristor, based on two parameters: turn-off and voltage class. A numerical calculus of voltage drop as a function of current density is proposed. A program was written for instant determination of the conduction area of a thyristor during its start-up period, based on an experimental formula for the plasma propagation velocity. A general numerical calculus program was set up for obtaining the energy dissipation in a thyristor subjected to a sinusoidal current wave. ESA

N77-13330*# Duke Univ., Durham, N.C. Dept. of Electrical Engineering.
STATE-PLANE TRAJECTORIES USED TO OBSERVE AND CONTROL THE BEHAVIOR OF A VOLTAGE STEP-UP DC-TO-DC CONVERTER
William W. Burns, III and Thomas G. Wilson 1976 11 p refs Presented at the Power Electron. Specialists Conf., Cleveland, 1976 Submitted for publication
(Grant NGL-34-001-001)
(NASA-CR-149248) Avail: NTIS HC A02/MF A01 CSCL 09A

State-plane analysis techniques are employed to study the voltage step up energy storage dc-to-dc converter. Within this framework, an example converter operating under the influence of a constant on time and a constant frequency controller is examined. Qualitative insight gained through this approach is used to develop a conceptual free running control law for the voltage step up converter which can achieve steady state operation in one on/off cycle of control. Digital computer simulation data is presented to illustrate and verify the theoretical discussions presented. Author

N77-13331*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MICROWAVE POWER TUBES FOR SPACE APPLICATIONS
Henry Kosmahl 1976 8 p Presented at Intern. Electron Devices Meeting, Washington, D. C., 6-8 Dec. 1976
(NASA-TM-X-73571; E-9020) Avail: NTIS HC A02/MF A01 CSCL 09A

Feasibility evaluations of klystron amplifiers for conversion of solar power in synchronous orbit into microwave power at 2.4 GHz and transmission to earth were carried out. It was found that amplitrons and klystrons, using a depressed collector augmentation, can achieve efficiencies in excess of 80% if the power output is kept higher than 50 kW. Body wound selenoid provides the needed beam-focusing field. Narrow bandwidth requirements permit a low cathode loading density of 0.5 A/sq cm produced at approximately 850 centigrades. Emission tests indicate a potential life expectancy of 20 to 40 years. I.M.

N77-13332*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE DESIGN AND FABRICATION OF MICROSTRIP OMNIDIRECTIONAL ARRAY ANTENNAS FOR AEROSPACE APPLICATIONS
T. G. Campbell, M. W. Appleton, and Thomas K. Lusby Nov. 1976 67 p refs
(NASA-TM-X-73979) Avail: NTIS HC A04/MF A01 CSCL 09A

A microstrip antenna design concept was developed that will provide quasi-omnidirectional radiation pattern characteristics about cylindrical and conical aerospace structures. L-band and S-band antenna arrays were designed, fabricated, and, in some cases, flight tested for rocket, satellite, and aircraft drone applications. Each type of array design is discussed along with a thermal cover design that was required for the sounding rocket applications. Author

N77-13333*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PREDICTION AND MEASUREMENT OF RADIATION DAMAGE TO CMOS DEVICES ON BOARD SPACECRAFT
R. A. Cliff, V. Danchenko, E. G. Stassinopoulos, M. Sing, G. J. Brucker (RCA, Princeton, N. J.), and R. S. Ohanian (RCA, Princeton, N. J.) Oct. 1976 10 p refs
(NASA-TM-X-71230; X-700-76-227) Avail: NTIS HC A02/MF A01 CSCL 09C

The CMOS Radiation Effects Measurement (CREM) experiment is presently being flown on the Explorer-55. The purpose of the experiment is to evaluate device performance in the actual space radiation environment and to correlate the respective measurements to on-the-ground laboratory irradiation results. The experiment contains an assembly of C-MOS and P-MOS devices shielded in front by flat slabs of aluminum and by a practically infinite shield in the back. Predictions of radiation damage to C-MOS devices are based on standard environment models and computational techniques. A comparison of the shifts in CMOS threshold potentials, that is, those measured in space to those obtained from the on-the-ground simulation experiment with Co-60, indicates that the measured space damage is smaller than predicted by about a factor of 2-3 for thin shields, but agrees well with predictions for thicker shields. Author

N77-13334*# Duke Univ., Durham, N.C. Dept. of Electrical Engineering.
FAST-RESPONSE FREE-RUNNING FREQUENCY-STABILIZED dc-TO-dc CONVERTER EMPLOYING A STATE PLANE-TRAJECTORY CONTROL LAW
Stephen D. Huffman, William W. Burns, III, Thomas G. Wilson, and Harry A. Owen, Jr. [1976] 5 p ref
(Grant NGL-34-001-001)
(NASA-CR-149318) Avail: NTIS HC A02/MF A01 CSCL 09C

Implementations of a state-plane-trajectory control law for

energy storage dc-to-dc converters are presented. Performance characteristics of experimental voltage step-up converter systems employing these implementations are reported and compared to theoretical predictions. Author

N77-13335*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEARING AID MALFUNCTION DETECTION SYSTEM Patent Application
Roger L. Kessinger, inventor (to NASA) (Martin Marietta Corp., Denver) Filed 8 Nov. 1976 26 p
(Contract NAS9-14215)
(NASA-Case-MSC-14916-1; US-Patent-Appl-SN-739914) Avail: NTIS HC A03/MF A01 CSCL 09C

A system for detecting malfunctions in electrical signal processing circuits is presented. Malfunctions of a hearing aid are detectable in the form of frequency distortion and/or inadequate amplification by the hearing aid amplifier, as well as weakening of the hearing aid power supply. A test signal is generated and a timed switching circuit periodically applies the test signal to the input of the hearing aid amplifier in place of the input signal from the microphone. The resulting amplifier output is compared with the input test signal used as a reference signal. The hearing aid battery voltage is also periodically compared to a reference voltage. A warning is triggered if the power supply voltage falls below the reference voltage. Author

N77-13336*# Sperry Rand Corp., Huntsville, Ala.
STATISTICAL PROPERTIES OF FILTERED PSEUDO-RANDOM DIGITAL SEQUENCES
G. D. Weathers Jan. 1972 136 p refs
(Contract NAS8-21812)
(NASA-CR-150124; TR-SP-275-0599) Avail: NTIS HC A07/MF A01 CSCL 09A

A tutorial presentation of pseudo-random digital sequences, their generation and properties is given. The results of a study of filtered pseudo-random sequences, and their statistical properties are reported. The generator, to be used in a telemetry communications system test unit, must generate its pseudo-random signals by filtering a long digital sequence. Desired signal properties include: (1) approximately Gaussian amplitude probability density function; and (2) signal spectral envelope approximately that of the filter being used in the generator. Filtered maximum-length sequences have been used for this, and similar applications in the past. The results were good for low-pass filtered sequences when the ratio of digital clock frequency to filter cutoff frequency was between fifteen and twenty. However, for higher values of this ratio, a definite skewing of the amplitude density function was observed. Author

N77-13337*# Texas Instruments, Inc., Dallas.
INVESTIGATION OF FIELD INDUCED TRAPPING ON FLOATING GATES
W. Milton Gosney [1975] 80 p refs
(Contract NAS1-13610)
(NASA-CR-145091) Avail: NTIS HC A05/MF A01 CSCL 09C

The development of a technology for building electrically alterable read only memories (EAROMs) or reprogrammable read only memories (RPROMs) using a single level metal gate p channel MOS process with all conventional processing steps is outlined. Nonvolatile storage of data is achieved by the use of charged floating gate electrodes. The floating gates are charged by avalanche injection of hot electrodes through gate oxide, and discharged by avalanche injection of hot holes through gate oxide. Three extra diffusion and patterning steps are all that is required to convert a standard p channel MOS process into a nonvolatile memory process. For identification, this nonvolatile memory technology was given the descriptive acronym DIFMOS which stands for Dual Injector, Floating gate MOS. Author

N77-13338*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHIELDED CONDUCTOR CABLE SYSTEM Patent Application
Kent D. Castle, inventor (to NASA) Filed 30 Nov. 1976 12 p
(NASA-Case-MSC-12745-1; US-Patent-Appl-SN-746579) Avail: NTIS HC A02/MF A01 CSCL 09C

A method is described for circuit protection from abnormal surge voltages induced in a shielded cable. The cable system carries one or more insulated conductors completely enclosed within a shield having one end connected to ground. A lightning-protector network connects the other end of the shield to ground. The protector network is normally open circuited and becomes short circuited only in response to a momentary abnormal surge voltage induced in the shield. The protector network's open-to-short impedance change completes a conductive circuit path between the shield and the two grounded ends for conducting a shield current which has the desired effect of protecting the signal carrying conductors in the cable from the large surge voltage. Author

N77-13339# Rohde and Schwartz, Munich (West Germany). Abteilung Mikroelektronik.
VAPOR DEPOSITED THIN FILM CIRCUITS ON CERAMIC SUBSTRATES Final Report
Eberhardt Salzmann and Hans Delfs Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 26 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol. (BMFT-FB-T-76-26) Avail: NTIS HC A03/MF A01; ZLDI, Munich, DM 5,05

Ceramic substrates from different manufacturers show considerable differences in those properties that make them suitable for the production of thin-film circuits. A sufficiently long pre-aging period improves the stability of NiCr resistors evaporated onto ceramic substrates: 0.3 % change of resistivity after 1000 hrs at 175 C can be obtained. Experiments to minimize the temperature coefficient of resistivity (TCR) resulted in layers having TCR values in range of plus or minus 25 ppm/C; however, a disadvantage of optimum TCR values is reduced resistor stability. A high yield of resistors having tolerances within plus or minus 5% can be obtained only on high quality substrates and by using an improved geometry during evaporation. The optimum geometry was evaluated. Author (ESA)

N77-13340# European Space Research and Technology Center, Noordwijk (Netherlands).
CONTINUOUS-TIME MODELS FOR PWM SWITCHED CONVERTERS IN HEAVY AND LIGHT MODES
H. A. Owen, Jr., J. G. Ferrante, and A. Capel Paris ESA Sep. 1976 114 p refs
(ESA-TN-135-ESTEC) Avail: NTIS HC A06/MF A01

Analytical expressions were developed from which time and frequency domain behavior of pulse width modulated, inductor energy storage, dc-to-dc converters may be determined. The analytical basis for these expressions is the conversion of a set of series-form solutions for the elementary network structures into which a given converter can be decomposed into a set of difference equations. These difference equations, which yield the solution at the end of a switching interval $(n + 1)T$, are in terms of the initial conditions at nT and the converter parameters. Taking the average of the state vector over a period T by dividing the $X(n + 1)T) - X(nT)$ by T leads to an approximation to the set of nonlinear and/or tune-varying differential equations describing the converter. By a simple Taylor series expansion to the first-order term, expanding about the mean values of the state and forcing function variables, a set of linear differential equations is obtained. These linear equations may be transformed formally into the complex frequency domain, after which transfer functions between duty cycle and output voltage and between input voltage and output voltage may be derived. Author (ESA)

N77-13341# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
PRODUCTION ENGINEERING MEASURES, VAPOR PHASE COOLED TRAVELING-WAVE TUBES Quarterly Progress Report, 2 Mar. - 1 Sep. 1975
R. B. Douglas 1 Sep. 1975 15 p refs
(Contract DAAB05-72-C-5863)
(AD-A025360; W-05231-12/13; QPR-12; QPR-13) Avail: NTIS HC A02/MF A01 CSCL 09/1

This report consolidates the progress during the 12th and 13th quarters of the Production Engineering Measures Program, which proposes to establish a manufacturing capability for a vapor phase cooled, high efficiency, C-band traveling-wave tubes.

Text discussions will include fabrication and test results obtained from build numbers 4, 5 and 6 636H TWT's. Author (GRA)

N77-13342# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
PRODUCTION ENGINEERING MEASURES, VAPOR PHASE COOLED TRAVELING-WAVE TUBES Quarterly Progress Report, 2 Sep. - 1 Dec. 1975
R. B. Douglas 1 Dec. 1975 16 p ref
(Contract DAAB05-72-C-5863)
(AD-A025361; W-05231-14; QPR-14) Avail: NTIS HC A02/MF A01 CSCL 09/1

This report covers the Fourteenth Quarter effort of a Production Engineering Measures Program to establish a manufacturing capability for vapor phase cooling of high-efficiency C-band traveling-wave tubes. Text material of this reort will cover the fabrication efforts and test data obtained during the report period. Discussion will center about Serial Number 6 and the thermal analysis efforts completed during the Quarter. Author (GRA)

N77-13343# Information Systems, Menlo Park, Calif.
ANTENNA MODELING PROGRAM ENGINEERING MANUAL
10 Jul. 1972 127 p refs
(Contract N00014-72-C-0187)
(AD-A025890) Avail: NTIS HC A06/MF A01 CSCL 09/5

The report describes the theory of the operation of the Antenna Modeling Program delivered and implemented for the Naval Research Lab, The Rome Air Development Center, the US Army Strategic Communications Command, the Naval Ship Engineering Center, and US Army ECOM/Communications Systems. The theory and the applicability of its reduction to practical numerical techniques for the CDC3800, GE645, CDC6500, CDC6700, and B5700 machines located at the five Government facilities cited (respectively) are essentially independent of the peculiar characteristics of the machines. The Engineering Manual describes their theory and techniques and is therefore applicable to all delivered versions of the Antenna Modeling Program. GRA

N77-13344# Westinghouse Electric Corp., Cheswick, Pa. Electro-Mechanical Div.
DESIGN AND DEVELOPMENT OF A SEGMENTED MAGNET HOMOPOLAR TORQUE CONVERTER Semiannual Technical Report, period ending 30 Nov. 1975
C. J. Mole, F. G. Arcella, E. Berkey, D. J. Boes, V. B. Doshi, R. A. Feranchak, H. E. Haller, III, J. L. Johnson, S. A. Karpathy, A. R. Keeton et al Feb. 1976 79 p refs
(Contract DAHC15-72-C-0229; ARPA Order 2174)
(AD-A024993; EM-4790) Avail: NTIS HC A05/MF A01 CSCL 09/3

This program is for the research and development of a new mechanical power transmission concept (the segmented magnet homopolar torque converter). The purpose of this device is to convert unidirectional torque of constant speed such as from a steam turbine prime mover into variable speed output torque in either the forward or reverse directions. The concept offers an efficient, lightweight low volume design with potential application over a wide range of speeds and power ratings in the range from hundreds to tens of thousands of horsepower. This machine concept can be applied to commercial and military advanced concept vehicles for both terrain and marine environments. In phase I the technical problems were reviewed, the machine concepts were studied, and a detailed technical plan was evolved for the entire program. In Phase II, a reliable constant speed current collection system was developed and demonstrated in an actual segmented magnet homopolar generator segmag. The objective of Phase III is to extend the technology developed in Phase II for constant speed machines to the case of the torque converter which must operate at variable and reversing speeds. The program places particular emphasis on the technology of advanced current collection systems for the reason this is essential for the success of the homopolar machine concept. Phases I, II, and the initial Phase III effort were based on the use of liquid metal current collectors. In Phase III- A Beginning July 1, 1975 work was redirected toward the use of a promising current collection concept utilizing a solid brush-gas-vapor additive system. GRA

N77-13345# Raytheon Co., Waltham, Mass. Research Div.
MANUFACTURING METHODS AND TECHNOLOGY MEASURE FOR ARC PLASMA SPRAYED PHASE SHIFTER ELEMENTS Quarterly Progress Report, 1 Jan. - 31 Mar. 1976
H. J. VanHook, D. Masse, and J. Saunders Apr. 1976 34 p
(Contract DAAB07-75-C-0043)
(AD-A025025; S-2020; QPR-3) Avail: NTIS HC A03/MF A01 CSCL 09/5

Physical property data are given on a series of nonmagnetic Li-Ti ferrite dielectrics which have been used in arc plasma spraying of phase shifter samples. Thermal expansion data are given on a new series of compositions with variations in Li-Ti and Al content. A new fully reacted ferrite powder has been characterized in terms of particle size and magnetic properties. The functioning of the APS equipment has been substantially improved in this quarter, such that sample coating and transfer is now within twenty minutes. Loss of dielectric rods through thermal shock has recently been reduced significantly by lowering temperature in the transfer oven. Microwave and hysteresis loop data on a series of APS samples using a series of dielectrics and the new ferrite powder is reported. GRA

N77-13346# Purdue Research Foundation, Lafayette, Ind.
CONDUCTION MECHANISMS IN THICK FILM MICROCIRCUITS Final Report
R. W. Vest Dec. 1975 331 p refs
(Grants DAHC15-70-G7; DAHC15-73-G8; ARPA Order 1642)
(AD-A024825) Avail: NTIS HC A15/MF A01 CSCL 09/5

This report describes a wide range of experimental studies which led to the development of models relating the sheet resistance and temperature coefficient of resistance (TCR) of thick film resistors to physical properties of the ingredient materials. The system studied was ruthenium dioxide conductive (RuO_2), lead-borosilicate glass (63% PbO-25% B_2O_3-12% SiO_2) and alumina substrate (96% Al_2O_3-AlSiMag 614). The pertinent physical properties of these ingredient materials were measured when these data were not available from previous work. The resistor properties and materials properties were related through studies of microstructure development. The processes involved in microstructure development include: glass sintering, glass spreading, microrearrangement, glass densification, conductive sintering, and conductive ripening. The kinetics of these processes depend on surface tension of the glass, viscosity of the glass, density of the glass, particle size of the glass, particle size of the conductive, surface energy of the conductive, interfacial energy between the conductive and the glass, and solubility of the conductive in the glass. The sheet resistance and TCR depend on all these materials properties in addition to resistivity and TCR of the conductive. A model is developed which reproduces the experimental blending curve over six orders of magnitude in sheet resistance, and can account for any observed TCR in thick film resistors. Author (GRA)

N77-13347# Westinghouse Electric Corp., Pittsburgh, Pa.
GALLIUM ARSENIDE VERTICAL CHANNEL INSULATED GATE FIELD EFFECT TRANSISTOR Annual Report, Jan. - Dec. 1975
M. C. Driver, D. A. Tremere, and T. M. S. Heng 18 Jun. 1976 57 p refs
(Contract N00014-75-C-0418; NR Proj. 251-019; RF54581001)
(AD-A027442; Rept-76-9G7-VMIST-R1) Avail: NTIS HC A04/MF A01 CSCL 09/1

Basic studies of the various technologies relevant to the development of a power microwave vertical channel gallium arsenide insulated gate field-effect transistor have been carried out. The results indicate that while some technologies are in hand, a number of problems still exist in the areas of insulator stability and the n(+)-p-n(-)-n(+) profile formation. Author (GRA)

N77-13348# Michigan Univ., Ann Arbor. Electron Physics Lab.
PROPERTIES OF SEMICONDUCTOR MATERIALS FOR HIGH-POWER MICROWAVE GENERATION Final Report, 1 Apr. 1971 - 31 Jan. 1976
P. E. Bauhahn, J. R. East, R. O. Grondin, G. I. Haddad, and P. J. McCleer Nov. 1975 67 p refs

(Grant AF-AFOSR-2035-71; AF Proj. 9763)
(AD-A025100; AFOSR-76-0549TR; Rept-005030-F) Avail: NTIS HC A04/MF A01 CSCL 09/5

The objectives of this program were to study the fundamental properties of semiconductor materials and devices and their utilization in microwave power generation, amplification, detection, and control and thus ultimately to improve the state of the art in microwave devices. Work was conducted in the following areas: IMPATT Devices, Properties of BARITT Devices, BARITT Device Fabrication and Results, Tunnel Transit-Time Devices, BARITT Varactors, and Video Detectors and Mixers Using BARITT Devices. Author (GRA)

N77-13254# Technische Hogeschool, Eindhoven (Netherlands).
A COMPARISON OF EIGHT ANTENNA TYPES FOR SATELLITE COMMUNICATION GROUND STATIONS
J. Dijk and E. J. Maanders *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 147-158 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N77-13349 British Library Lending Div., Boston Spa (England).
HEAT-AND FLOW TECHNICAL STUDIES FOR CROSS-FLOW OF GASES OVER BANKS OF FINNED TUBES. 1. EXPERIMENTAL ARRANGEMENT AND RESULTS OF MEASUREMENTS AT HIGHER PRESSURES
H. Brauer 24 Aug. 1976 20 p refs Transl. into ENGLISH of Chemie-Ingenieur-Tech., Duisburg (West Ger.), v. 33, no. 5, 1961 p 327-335
(BLL-M-24404-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Heat transfer and flow resistance were measured in a cross flow on 15 banks of tubes of different shape and arrangement. The experiments at 11 atm. pressure with smooth and finned tubes confirm the theory of similarity. Formulas arrived at from similarity values are used for gases as well as liquids. The range of application of known equations for the heat transfer in banks of smooth tubes is extended to Reynolds numbers of up to 150,000. The effect of the distance between fins and between the tubes is studied. Author

N77-13350 Toledo Univ., Ohio.
LIQUID JET IMPINGEMENT NORMAL TO A DISK IN ZERO GRAVITY Ph.D. Thesis
Thomas Louis Labus 1976 259 p
Avail: Univ. Microfilms Order No. 76-24927

An experimental and analytical investigation was conducted to determine the free surface shapes of circular liquid jets impinging normal to sharp-edged disks under both normal and zero gravity conditions. An order of magnitude analysis was conducted indicating regions where viscous forces were not significant when computing free surface shapes. The demarcation between the viscous and inviscid region was found to depend upon the flow Reynolds number and the ratio between the jet and disk radius. Dissert. Abstr.

N77-13351 Stanford Univ., Calif.
HEAT TRANSFER TO A FULL-COVERAGE FILM-COOLED SURFACE WITH 30-DEG SLANT-HOLE INJECTION Ph.D. Thesis
Michael Edward Crawford 1976 250 p
Avail: Univ. Microfilms Order No. 76-25986

An experimental and analytical study is presented of heat transfer to a turbulent boundary layer over a full coverage film cooled surface. A flat test surface consisting of a film cooling section and a recovery section was used in the experiments. The film cooling section contained 11 rows of holes, with each hole 1.03 cm diameter and spaced five diameters apart in a staggered array. The holes were inclined 30 degrees to the surface in the downstream direction. Ten diameter spacing was also studied by plugging appropriate holes. The downstream recovery section was instrumented to study the flow as it recovers from the effects of injection. The data were taken with injection temperature equal to wall temperature and also equal to mainstream temperature at each M to build two fundamental data sets. For the case of injection temperature equal to wall temperature the Stanton number decreased, reaching a minimum at M of 0.4, with higher M causing an increase in Stanton number. Dissert. Abstr.

N77-13352 Arkansas Univ., Fayetteville.
RECTILINEAR FLOW OF PERFECT PLASTICS IN NON-CIRCULAR DUCTS Ph.D. Thesis
Ravindranath Jayaram Meda 1976 164 p
Avail: Univ. Microfilms Order No. 76-26386

An equation is presented for the flow of a perfect plastic in noncircular ducts. The principle of minimum energy dissipation was used to develop a general theory. Numerical solutions were obtained for flow in ducts with cross sections in the shape of equilateral triangles and squares. The results are given for all values of the slip coefficient K. Experiments were made using Bentonite clay slurry in triangular, square, and circular ducts to verify the proposed theory. Data were obtained by measuring the pressure drop in a certain length of duct and by measuring the velocity of a moving particle. Theoretical solutions were also obtained for the flow of perfect plastics in rectangular ducts of different aspect ratios and for eccentric annuli over the entire range of diameter ratios and eccentricities. All these calculations are for K = 1, i.e., no slip at the wall. Dissert. Abstr.

N77-13353 Akron Univ., Ohio.
ON BIOT'S VARIATIONAL PRINCIPLE FOR SOME TRANSIENT HEAT TRANSFER PROCESSES INVOLVING THERMAL RADIATION Ph.D. Thesis
Lian-Tuu Yeh 1976 222 p
Avail: Univ. Microfilms Order No. 76-24403

Biot's variational principle is adapted to some transient heat transfer processes involving thermal radiation. An effort is made to determine the temperature distribution of a radiating and convecting slab with temperature dependent thermal properties and time dependent heat generations. For the purpose of comparison, the same problem is also sovled using a finite difference scheme and other analytical approximate methods such as integral and double integral methods. Biot's variational method is further extended to determine the heat transfer characteristic in a multi-layer slab with a radiative boundary condition. Solutions of temperature distribution in a two-layer composite slab with contact resistance at interface are presented in detail. When the surface of materials reaches the melting or fusion temperature, a change of phase may take place. Solutions of heat transfer in a finite region of materials involving melting or solidification associated with variable thermal properties subjected to radiation and convection are obtained. Dissert. Abstr.

N77-13354 Toledo Univ., Ohio.
DROP-SIZE DISTRIBUTIONS OF SPRAYS PRODUCED BY FAN-JET PRESSURE NOZZLES Ph.D. Thesis
William Sied Janna 1976 158 p
Avail: Univ. Microfilms Order No. 76-24923

The drop size distribution of Newtonian and non-Newtonian liquid sprays was measured. The sprays were produced by fan jet pressure nozzles, used with paint atomizing equipment, operating in the pressure range of 500 to nearly 3000 psig. A collection device was contructed and droplets were captured on soot coated microscope slides. Subsequent sizing of the impacted particles, measured with a microscope, yielded drop size distribution data of accumulated volume per cent versus diameter. It was postulated that the initial cause of liquid breakup into a spray is due to wall shear existing at the exit plane of the nozzle. An experimental analysis was performed to relate the nozzle wall shear to the volume median diameter of the spray distribution. A linear correlation was found to exist on a semilog graph. Drop size distribution data on preorifice-nozzle combinations were also recorded. Dissert. Abstr.

N77-13355 New Mexico Univ., Albuquerque.
ANALYSIS OF A HEAT PIPE EXCHANGER Ph.D. Thesis
Joseph Olorunfemi Amode 1976 131 p
Avail: Univ. Microfilms Order No. 76-25650

A computer program was developed to predict heat pipe performance, finned-tube heat exchanger performance, and the overall performance of a finned-tube heat exchanger. The computer analysis uses conventional heat exchanger design techniques and a new heat pipe design technique which includes probabilistic design of artery wick heat pipes. The heat pipe exchanger analysis program is normally used by specifying the mass flow rates, inlet temperatures, and inlet pressures of the hot and cold air streams. The heat transfer capability of the heat pipes was matched with that of the finned-tube heat exchanger in order to select appropriate heat pipes, and thus obtain minimum volume, weight, and cost for the heat exchanger. The results predicted by the heat pipe heat exchanger analysis program were compared to the data available in the literature, and relatively good agreement was obtained. Dissert. Abstr.

N77-13356 Princeton Univ., N.J.
VELOCITY PROFILES IN CORE-ANNULAR FLOW USING A LASER DOPPLER VELOCIMETER Ph.D. Thesis
Joel Terry Shertok 1976 127 p
Avail: Univ. Microfilms Order No. 76-23837

The effect of the fluctuating interface on the bulk velocity field in each of the liquid phases and the effect of the outer liquid phase on the entry length of the inner liquid phase is studied. The velocity field in a vertical core-annular configuration, using glycerine as the liquid core and Flexon-845 (an Exxon process oil) as the outer sheath, was probed using a laser Doppler velocimeter. Results indicate that the fluctuating interface has little measurable effect on the main bulk flow since: (1) the axial velocity components agreed well with the theoretical values obtained from the solution of the Navier-Stokes equations, and (2) no detectable tangential velocity components could be found, even very near the interfacial region. The stream function/vorticity equations were finite differenced, and solved on a digital computer. Results gave qualitative information on the core-annular entry length problem, namely that the radial disturbances to the bulk flow quickly died out. Such a result was verified (at least qualitatively) by the experimental results. Dissert. Abstr.

N77-13357 Princeton Univ., N.J.
THE EFFECTS OF SHEAR AND VORTICITY OF THE DEFORMATION OF A DROP Ph.D. Thesis
Farokh Shafizadeh Hakimi 1976 158 p
Avail: Univ. Microfilms Order No. 76-19439

The theory for flow behavior of a single Newtonian drop under a uniform stress field was reviewed and applied to flow-induced deformation of the drop in an orthogonal rheometer flow system. This system was chosen in order to isolate the separate effects of the rate of deformation and vorticity on the drop shape and orientation. The results for a single drop were extended to predict the bulk rheological behavior of a dilute emulsion composed of two Newtonian phases. It is shown that the bulk behavior is non-Newtonian because of the deformation of the drops. The effect of vorticity on the components of bulk stress was investigated. It is shown that, as a rheometer, the orthogonal rheometer does not give a unique correspondence between stress and shear rate because of the contribution of vorticity. For instance, at any fixed value of the shear rate, the bulk stress may have multiple values, depending on the magnitude of the vorticity. Dissert. Abstr.

N77-13358 Princeton Univ., N.J.
SECONDARY FLOW INDUCED BY A CYLINDER OSCILLATING IN A VISCOELASTIC LIQUID Ph.D. Thesis
Ching-Feng Chang 1976 205 p
Avail: Univ. Microfilms Order No. 76-23819

Steady streaming flow induced by an oscillating cylinder in Newtonian and viscoelastic liquids was studied theoretically and experimentally. A flow visualization technique, using small particles as tracers, was employed to observe the flow patterns and to measure velocity profiles from photographs. Qualitative results show that a reversed secondary flow is found in a dilute polymer solution as compared to that of a Newtonian fluid under the same conditions. This reversal of the steady secondary flow persists to a very dilute polymer solution. Steady secondary flow in these systems is due to the influence of nonlinear terms in the equation of motion. When polymer is added to the Newtonian solvent, the change in flow direction is caused by dominance of a nonlinear viscoelastic response over inertial effects. Dissert. Abstr.

N77-13359 Virginia Univ., Charlottesville.
WIGGLE FLOW OF A VISCOELASTIC FLUID Ph.D. Thesis
Mahir Ali Arikol 1976 144 p
Avail: Univ. Microfilms Order No. 76-25027

The kinematics and normal stress differences of a viscoelastic fluid undergoing wiggle flow were experimentally determined employing noncontact measuring techniques, i.e., laser doppler anemometry for velocity measurements, and flowbirefringence for stress measurements. The kinematics along the centerline clearly showed the effect of flow rate on the behavior of the viscoelastic fluid. These data were also compared with the data obtained for a Newtonian fluid, Primol 355, under identical flow conditions. That the viscoelastic fluid behaves like a Newtonian fluid under very low shear rates was experimentally verified. The normal stress data along the centerline clearly exhibited a delayed growth of stress which should be attributed to the expected memory effects in vicoelastic fluid flow. These data were used in conjunction with the velocity data to evaluate two constitutive equations: the White-Metzner equation and the Oldroyd 3-constant equation. Dissert. Abstr.

N77-13360 Pennsylvania State Univ., University Park.
THE NUMERICAL SOLUTION OF THE STEADY FLOW OF NEWTONIAN AND NON-NEWTONIAN FLUIDS THROUGH A CONTRACTION Ph.D. Thesis
Thomas B. Gatski 1976 143 p
Avail: Univ. Microfilms Order No. 76-24765

The equations describing the steady two dimensional flow of a dilute suspension of marcomolecules, a non-Newtonian fluid, are numerically modeled using a finite difference technique. The problem is formulated in terms of the vorticity, stream function and the appropriate rheological equation of state, the constitutive equation. The structure of the basic Newtonian solvent flow is examined, with estimates of boundary layer thickness and discretizing errors discussed. In addition contour plots of the stream function, vorticity, and stresses are presented. Computation and theoretical estimates of molecular stretching and pressure distribution along the centerline are presented. Contour plots are also presented in the non-Newtonian problem for the shear and normal stresses throughout the flow domain. The effect of concentration of polymer additive and molecular relaxation time on the flow structure are also discussed. Dissert. Abstr.

N77-13361 Cincinnati Univ., Ohio.
A SOLUTION TO THE THREE DIMENSIONAL SECONDARY FLOW PROBLEM Ph.D. Thesis
Wishaa M. Hosny 1976 157 p
Avail: Univ. Microfilms Order No. 76-25126

A theoretical analysis is established to deal with the inviscid three dimensional rotational flow which results from the secondary vorticity in turning channels. The equations of motion are written and manipulated in a special form to include the secondary vorticity as a variable among the other flow variables. The equations in their forms are not attractable to analytic solutions and therefore numerical solutions are adopted. The solution to the problem in general yields to the full picture of the three dimensional flow together with the different characteristics of the secondary vorticity distribution in the flow field. Since there was no limitation on the flow deflection angle, the channel radius of curvature or the flow inlet shear, the analysis is then recommended to be used to obtain the rotational flow in the channels of highly loaded turbomachinery cascades. Dissert. Abstr.

N77-13362 Rochester Univ., N.Y.
THE EFFECT OF SURFACE-ACTIVE AGENTS ON RADIAL FREE-SURFACE FLOW Ph.D. Thesis
Venkataratnam Ramachandran 1976 284 p
Avail: Univ. Microfilms Order No. 76-24021

The interaction between hydrodynamics and interfacial mass transfer was studied for radial free surface flow. The effects of dilute aqueous solutions of alcohols on the surface velocity were

measured. Retardations of the surface velocity and enhancement of the initial acceleration of the free surface were observed. The hydrodynamic model contains the following features: consideration of the tangential shear stress balance at the free surface and evaluation of the gradients of interfacial tension by means of a mass transfer model. Results reveal that adsorptive accumulation of surfactant retards surface motion while convective redistribution of surfactant in the interface tends to increase the initial surface acceleration for radial free surface flow. Dissert. Abstr.

N77-13363 Pennsylvania State Univ., University Park.
EFFECT OF LUBRICATION ADDITIVES ON FLOW IN THIN FILMS Ph.D. Thesis
Joseph T. Maskew, Jr. 1976 112 p
Avail: Univ. Microfilms Order No. 76-24785

Cellulose filters with a mean pore diameter of 0.2 to 1.2 microns were used to examine the viscous flow characteristics of lubrication additives in nonpolar hydrocarbon fluids. The filter was inserted in place of the calibrated capillary in an apparatus similar in design and operation to an Ostwald-Fenske viscometer. Measurements with a nonpolar hydrocarbon base stock of super-refined mineral oil in these filters indicate that Darcey's law is obeyed. A variety of lubrication additives was examined in this apparatus including organic acids, resin fractions of paraffinic crude oil, a barium sulfonate, an organic phosphate, and acryloids. These additives reduced the flow rate in the microcapillaries of the cellulose filters. Dissert. Abstr.

N77-13364 Illinois Univ., Urbana.
STEADY FLOW IN RAPIDLY ROTATING RECTANGULAR DUCTS WITH SMALL DIVERGENCE Ph.D. Thesis
Andres Calderon 1976 146 p
Avail: Univ. Microfilms Order No. 76-24051

Steady incompressible flow in a rectangular duct with a small divergence, rapidly rotating about an axis perpendicular to its center line, is studied. Inertia has been neglected and viscous effects are considered small. A prototype is formed by joining a semi-infinite constant-area duct and a semi-infinite duct with straight, slightly diverging (top and bottom) walls. This situation is the transition between the case of O(1) divergence and the case of no divergence, where the limit as the divergence goes to zero, is not valid. The study is divided in four stages, each one considering different orders of magnitude of the divergence as it decreases. Dissert. Abstr.

N77-13365 Washington Univ., Seattle.
SURFACE TENSION EFFECTS IN HEAT TRANSFER THROUGH THIN LIQUID FILMS Ph.D. Thesis
Thomas Edward Hinkebein 1976 196 p
Avail: Univ. Microfilms Order No. 76-25417

Heat transfer data for shallow liquid pools heated from below were determined in a modified Schmidt-Milverton apparatus. For pure liquids there was pronounced enhancement of the heat transfer rate due to surface tension driven convection, and surface tension and buoyancy modes were strongly coupled. For pools containing even small amounts of solutes, strong suppression of natural convection was observed, and the nature of the convection was changed from the stationary to an oscillatory mode. Non linear interactions between oscillatory and stationary modes were found to augment the heat transfer rate. A theoretical model is presented which accurately models stationary flow situations for Nu < or = 2. For solute bearing pools, which undergo purely oscillatory convection, the model predicts no enhancemnent of the heat flux. When both stationary and oscillatory modes of convection occur, the model underestimates the convective heat flux. Dissert. Abstr.

N77-13366+ Societe Bertin et Cie, Plaisir (France).
STABILIZATION OF HIGH SPEED LIQUID JETS. APPLICATION TO CUTTING AND DRILLING Final Report [STABILISATION DES JETS LIQUIDES A GRANDE VITESSE. APPLICATION AU DECOUPAGE ET AU PERCEMENT]
Caillault 18 Jun. 1975 72 p refs In FRENCH
(Contract DGRST-73-7-1771)
(NT-75-Ep-01) Avail: NTIS HC A04

Two methods for obtaining coherent high speed jets with small diameters are compared: optimization of internal nozzle geometry and addition of macromolecules to the fluid. Nozzle optimization was checked by measuring the pressure at different points in the jet. A method was established for simultaneous measurement of pressure and flow in a point of a straight section. A general parametric study related to the macromolecules has allowed defining the necessary concentration in water. The jets were visualized. Cutting tests were carried out at several pressures. A comparison is made with carbon laser cutting tools. ESA

N77-13367*# Old Dominion Univ. Research Foundation, Norfolk, Va.
TAP 1: A FINITE ELEMENT PROGRAM FOR STEADY-STATE THERMAL ANALYSIS OF CONVECTIVELY COOLED STRUCTURES Interim Report, 1 Sep. 1975 - 30 Sep. 1976
Earl A. Thornton Nov. 1976 135 p refs
(Grant NsG-1237)
(NASA-CR-145069; TR-76-M6) Avail: NTIS HC A07/MF A01 CSCL 20M

The program has a finite element library of six elements: two conduction/convection elements to model heat transfer in a solid, two convection elements to model heat transfer in a fluid, and two integrated conduction/convection elements to represent combined heat transfer in tubular and plate/fin fluid passages. Nonlinear thermal analysis due to temperature dependent thermal parameters is performed using the Newton-Raphson iteration method. Program output includes nodal temperatures and element heat fluxes. Pressure drops in fluid passages may be computed as an option. A companion plotting program for displaying the finite element model and predicted temperature distributions is presented. User instructions and sample problems are presented in appendixes. Author

N77-13368# Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
VIBRATION OF CANTILEVER WITH ELASTIC TANK CONTAINING LIQUID
Aleksander Kornecki Mar. 1976 54 p refs
(Publ-255) Avail: NTIS HC A04/MF A01

Free-flexural, torsional, and coupled flexural-torsional-vibration are analyzed of a uniform cantilever beam with an elastic tank at its free end. Special attention is paid to the effect of motion of liquid in the partially filled tank upon the vibration characteristics of the beam. Theoretical derivations are illustrated on a numerical example representing a typical uniform wing. Author

N77-13369# Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
DYNAMICS OF AN ELASTIC TANK PARTIALLY FILLED WITH LIQUID
Aleksander Kornecki Mar. 1976 50 p refs
(Publ-252) Avail: NTIS HC A03/MF A01

Equations of motion of an incompressible ideal liquid in a moving elastic vessel are referred to (moving) coordinate axes attached to the vessel. The equations are linearized by a standard perturbation method. The boundary conditions imposed on the velocity potential function are carefully derived. The restrictions imposed by the linearization upon the tank's motion are discussed. General expressions are derived for the resultant force and moment exerted by the moving liquid-solid system upon a supporting structure. Author

N77-13370# McGill Univ., Montreal (Quebec). Dept. of Mechanical Engineering.
THE VIRTUAL MASS MATRIX OF A CLUSTER OF CYLINDERS IN LIQUID CONTAINED BY A RIGID OUTER CYLINDER
S. Suss, M. Pustejovsky, and M. P. Paidoussis Jul. 1976 74 p refs
(MERL-76-1) Avail: NTIS HC A04/MF A01

Two different methods are described for the calculation of the virtual masses of arrays of parallel cylinders in liquid contained by an outer cylinder. The first method uses classical hydrodynamic concepts, while the second uses fluid finite elements. Illustrative examples are given to show how each method may be used and also to compare and cross check the two methods and to compare their computational efficiency. Author

N77-13371# Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.

FORCED VIBRATION OF LIQUID IN ELASTIC RECTANGULAR TANK
Aleksander Kornecki Mar. 1976 53 p refs
(Publ-254) Avail: NTIS HC A04/MF A01

Forced vibration of liquid in a partially filled rectangular tank with elastic walls is analyzed. The vibrations are enforced by the tank's harmonic translation and rotation. The side walls and/or the bottom are assumed to be deformable and perform flexural oscillations normal to their plane. The resultant force and moment are determined, maintaining the tank's dynamic equilibrium. General solutions are illustrated on examples.Author

N77-13372# Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
FORCED VIBRATION OF LIQUID IN A RIGID RECTANGULAR TANK
Aleksander Kornecki Mar. 1976 59 p refs
(Publ-253) Avail: NTIS HC A04/MF A01

The response of incompressible ideal liquid contained in a rigid rectangular tank to small simple harmonic motions of the tank in translation pitching and rolling is studied. Results of calculations are in good agreement with published experimental results. Author

N77-13373# Imperial Coll. of Science and Technology, London (England). Dept of Aeronautics.
THE DESIGN OF WIDE-ANGLE DIFFUSERS
R. D. Mehta Jun. 1976 30 p refs
(IC-Aero-76-03) Avail: NTIS HC A03/MF A01

A wide-angle diffuser effects a rapid expansion in the area of a wind tunnel or other duct, using some form of boundary layer control to prevent separation. In particular, wide-angle diffusers for wind tunnels, using screens for boundary layer control, are treated. Various charts are plotted to show the combinations of design parameters for successful and unsuccessful diffusers of this type. From these charts, some rules are inferred for the optimum screen combination for a given diffuser geometry. Some of the many other methods of boundary layer control are also compared and discussed, briefly. Author (ESA)

N77-13374# Bristol Univ. (England). Dept. of Aeronautical Engineering.
AN INVESTIGATION OF LOADS ON WEDGES PLACED IN SUPERSONIC JETS B.S. Thesis
M. J. Glister and T. J. Foreman Jun. 1976 76 p refs
(BU-198) Avail: NTIS HC A05/MF A01

A program for load measurements and base pressure distributions for several wedges placed in an axisymmetric supersonic jet is described. This was intended to be part of a larger experimental program on the boost blast effect encountered during missile launches. Three wedges were used, each having a base width equal to the nozzle diameter and with apex angles of 90, 60, and 45 deg. The jet was produced by a convergent-divergent nozzle giving an exit Mach number of 2.2. Loads, base pressures, and apex Pitot pressures were measured for each wedge placed at 0.1 and 2 nozzle exit diameters below the nozzle, which was operated at various under-expansion ratios in the range 1 to 2.4. Many shadowgraph pictures were taken for each case. Several interesting phenomena were observed, including switching of the flow between two stable conditions, very complicated shock intersections, and mixing of flows. The base loads, obtained by integrating the base pressure distributions, were found to constitute variable proportions of the overall load, varying from effectively zero in some cases to almost 50% in others. The overall loads were found to vary most strongly with pressure ratio and apex angle. It was also found that a load coefficient base on the nozzle chamber pressure was equal to sin (phi/4) to within 20%, where phi was the wedge apex half angle. Author (ESA)

N77-13375# Technische Hochschule, Aachen (West Germany). Inst. fuer Allgemeine Mechanik.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF HEAT CONDUCTION FOR LARGE TEMPERATURE DIFFERENCES AT ARBITRARY KNUDSEN NUMBER [THEORETISCHE UND EXPERIMENTELLE UNTERSUCHUNG DES WAERMESTROMS FUER GROSSE TEMPERATURDIFFERENZEN BEI BELIEBIGEN KNUDSENZAHLEN]
D. Braun Bonn DOKZENTBw 1976 36 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-76-3) Avail: NTIS HC A03/MF A01; DOKZENTBw DM 20

The plane steady-state heat conduction in monatomic gases at large temperature differences was studied. An approximate solution of the Boltzman equation, based on a two-sided Maxwellian velocity distribtion function and the model of Maxwellian molecules, was investigated. This solution, obtained by using Maxwell's moment method, can be used to determine macroscopic quantities of state for arbitrary Knudsen numbers. A plane heat conduction cell was used to check this theory experimentally. Temperature and pressure dependent heat transfer measurements for temperature differences up to 300 K were performed. It is shown that the four-moment solution corresponds well to the experimental data in the whole region from the continuum to the free molecular limit. Author (ESA)

N77-13376# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
OBSERVATIONS OF THE PARTICLE NUMBER DENSITY OF TWO-PHASE FLOWS IN MICROCHANNELS USING LASER ANEMOMETRY Ph.D. Thesis - Goettingen Univ. [LASERANEMOMETRISCHE BEOBACHTUNGEN DER TEILCHENANZAHLDICHTE VON ZWEIPHASENSTROEMUNGEN IN MIKROKANAELEN]
Nguyen-Tri-Hieu Mar. 1976 50 p refs In GERMAN
(Rept-4/1976) Avail: NTIS HC A03/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 12,05

The construction of a laser anemometer is described, and the first experiment in applying a statistical method to the measurement of particle number density of two phase flows in shallow channels is reported. The diameter of latex spheres used in the experiment was 1 micron and the depth of the channel approximately 0.15 mm. The liquid used was water. A strong reduction of the particle concentration in the edge and central zones of the channel was found for Reynolds numbers between 9 and 25.7, whereas in the remaining zone an increase of up to factor 3 was observed. ESA

N77-13377# Institut Franco-Allemand de Recherches, St. Louis (France).
POSSIBILITIES OF PRODUCING SUPERSONIC JETS WITH SHOCK TUBES [MOEGLICHKEITEN DER ERZEUGUNG VON UEBERSCHALLSTRAHLEN MIT STOSSROEHREN]
H. Oertel 6 May 1974 58 p In GERMAN
(ISL-16/74) Avail: NTIS HC A04/MF A01

The five possible methods investigated were: without expansion, with expansion in a wave, with expansion in a divergent nozzle, or with expansion in a Laval nozzle after compression in a standing or reflected shock. The equations for calculating the flow in the exhaust cross section are described and limits in applicability are indicated for each method. Flow data are given for typical cases, calculated for thermally and calorically perfect gases. ESA

N77-13378# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE TIME- AND THICKNESS SCALES IN THE MHD-RAYLEIGH PROBLEM. A FORMAL ANALYSIS
G. Schouten Nov. 1975 44 p refs
(VTH-205) Avail: NTIS HC A03/MF A01

The MHD Rayleigh problem was qualitatively analyzed in a systematic manner. Starting from the complete system of equations, simple subsystems were derived using the magnetic Prandtl number as a parameter. These subsystems are characteristic for the various boundary layer regions to be recognized. Initially a purely viscous and a much thicker e.m. layer exist. These layers develop an interactive character in a characteristic time T, the value of which is given. The viscous layer develops into a Hartmann layer of constant thickness and the e.m. layer develops into an Alfven wave with an electrically diffusing front.
Author (ESA)

N77-13379# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE DETERMINATION OF THE THROAT CONDITIONS FOR

EQUILIBRIUM AND FROZEN FLOWS IN ROCKET MOTOR NOZZLES
H. F. R. Schoeyer Feb. 1976 44 p refs
(VTH-209) Avail: NTIS HC A03/MF A01

A new method to determine the throat conditions for chemical reacting flows, such as occur in rocket nozzles (frozen and equilibrium) is presented. Contrary to other methods, the throat region is defined by an analytical criterium which can be solved directly, and not in an iterative way. An outline is given of the computational method, while results are presented in a graphical form. The method proves to be well applicable to digital computers. Author (ESA)

N77-13380# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Luftstrahlantriebe.
STABILIZATION OF HYDROGEN DIFFUSION FLAMES BY MEANS OF FLAME HOLDERS IN SUPERSONIC FLOW Ph.D. Thesis - Tech. Hochschule Aachen
Gert Winterfeld 29 Jun. 1976 84 p refs In GERMAN; ENGLISH summary Sponsored partly by Bundesmin. fuer Verteidigung Report will also be announced as translation (ESA-TT-347)
(DLR-FB-76-35) Avail: NTIS HC A05/MF A01; DFVLR, Cologne, DM 40.30

A parameter for the stabilization of flames by flame holders was derived by means of similarity considerations. Its validity was checked by experiments using different fuels and velocities up to the supersonic range. Experiments on the burning limits of hydrogen diffusion flames, stabilized by flame holders up to flow Mach numbers of 2.1, are described. Interactions between the subsonic wake downstream of the flame holder with an attached flame and the surrounding supersonic flow are discussed. They are used to improve the stabilizing characteristics of the flame holder. The changes of the base pressure, caused by the flame, are discussed. Author (ESA)

N77-13381# RAND Corp., Santa Monica, Calif.
BUOYANCY CROSS-FLOW EFFECTS ON THE BOUNDARY LAYER OF A HEATED HORIZONTAL CYLINDER Interim Report
L. S. Yao and Ivan Catton Apr. 1976 27 p refs
(Contract DAHC15-73-C-0181; ARPA Order 189)
(AD-A025187; R-1907-ARPA) Avail: NTIS HC A03/MF A01 CSCL 20/4

Using analytical methods, this report considers the effect of forces acting counter to laminar flow around heated bodies moving through water at low speeds. A cross flow is induced when a uniform horizontal stream passes along a heated semi-infinite horizontal cylinder. The cross-flow effects on heat transfer and shear stress grow as the fluid flows downstream and eventually becomes one of the dominant flow mechanisms. When the analysis applied to specifically a cylinder of one foot radius, heated to 100 degrees F, at speeds of about four feet per second, free convection effects should be considered for distances as great as four feet from the leading edge; at about 20 feet per second, out to ten feet from the leading edge. Author (GRA)

N77-13382# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
A CHEMICAL REACTION IN A TURBULENT JET Final Report
John R. Shea, III and H. W. Liepmann Apr. 1976 140 p refs
(Grant AF-AFOSR-2376-72; AF Proj. 9783)
(AD-A027697; AFOSR-76-0806TR) Avail: NTIS HC A07/MF A01 CSCL 07/4

The turbulent mixing and subsequent chemical reaction of gases is an essential part of many technological processes ranging from gas furnaces to chemical lasers. Generally the chemical kinetics are well understood, but the process of turbulent mixing is not. Knowledge of where turbulent fluid is mixed on a molecular scale is critical for predicting chemical reaction rates in the flow. In this experiment the rate of a chemical reaction in an axisymmetric turbulent jet is studied, and the results are used to determine the rate of molecular mixing in the jet. A turbulent jet containing dilute ozone in an inert mixture of nitrogen and oxygen flows into a stagnant tank of nitric oxide and nitrogen. When the gases mix on a molecular scale, the ozone and nitric oxide rapidly react to produce oxygen and nitrogen dioxide. The rate at which the mixing and chemical reaction proceeds is determined by using an ultraviolet light absorption techniques to measure the time averaged ozone concentration at points throughout the jets mixing zone. The experiment establishes a criterion for determining when a reaction of known chemical kinetics is sufficiently rapid that chemical non-equilibrium has a negligible effect on the mean reactant profile. GRA

N77-13963 European Space Agency, Paris (France).
THICKENING AND SEPARATION OF A TURBULENT BOUNDARY LAYER INTERACTING WITH AN OBLIQUE SHOCK
Jean Cousteix, Robert Houdeville et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 1-19 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 1-11 Original report in FRENCH previously announced as A76-28751 (For primary document see N77-13962 04-99)

N77-13964 European Space Agency, Paris (France).
BOUNDARY-LAYER DEVELOPING WITH POSITIVE PRESSURE GRADIENT IN A TURBULENT EXTERNAL FIELD
Daniel Arnal, Jean Cousteix, Roger Michel et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 20-42 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 13-26 Original report in FRENCH previously announced as A76-28752 (For primary document see N77-13962 04-99)

N77-13965 European Space Agency, Paris (France).
MASS OR ENERGY DIFFUSION MECHANISMS IN TURBULENT MIXING LAYERS
Pierre-Jacques Michard, Michel Izard et al *In its* La rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 43-59 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 27-35 Original report in FRENCH previously announced as A76-28753 (For primary document see N77-13962 04-99)

N77-13972 European Space Agency, Paris (France).
STUDY BY HYDRODYNAMIC VISUALISATIONS OF VARIOUS PROCESSES FOR CONTROLLING SEPARATED FLOWS
Henri Werle, Marc Gallon et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-2 (ESA-TT-352) Nov. 1976 p 26-68 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. 1976 p 75-94 Original report in FRENCH previously announced as A76-33745 (For primary document see N77-13970 04-99)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N77-13383 British Library Lending Div., Boston Spa (England).
MAGNETIC FIELD FORMING AND MEASURING ACCURACY IN MAGNETO-INDUCTIVE FLOW METERS
Immo Reinhold [1975] 26 p refs Transl. into ENGLISH from Archiv fuer technisches messen (Munich), v. 476, no. 9/75 p 139-144 In ENGLISH and GERMAN
(BLL-NEL-TT-2675-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.

In magneto-inductive flow meters, the measuring signal originates from the total area filled by the magnetic field. Instruments of this kind show the rate of flow over the cross section of the tube. Detailed measurements are presented of the relationship between flow profile and averaging capability

for various forms of field. A theoretical application is presented.
Author

N77-13384 Princeton Univ., N.J.
MULTIPLEXED FABRY PEROT INTERFEROMETERS Ph.D. Thesis
Robert A. King 1976 150 p
Avail: Univ. Microfilms Order No. 76-23832

The feasibility of using rotational Raman backscattering in the remote detection of atmospheric pollutants in the concentration range 300-400 ppm is discussed, with the signature and concentration of the pollutant determined by the multiplexing of its spectrum through a Fabry-Perot interferometer. Background rotational Raman and Rayleigh scattering is removed using a Fabry-Perot in reflection as a narrow band periodic notch filter. The variation of resonance width with B value, choice of optimum resonance for complex systems such as nitric oxide, and stringent criteria for free spectral range, Fabry-Perot etalon quality, and reflectivity are discussed for both the pollutant summing Fabry-Perot and for the background rejection Fabry-Perot. A combination of the increased scattering cross section of rotational over vibrational Raman, the multiplexing effect of the Fabry-Perot, and the increased light gathering power of a Fabry-Perot gives an estimated improvement in signal strength. Dissert. Abstr.

N77-13385 Rochester Univ., N.Y.
A STUDY OF THE ANALOGY BETWEEN ION AND LIGHT SPECTROMETRY LEADING TO THE DEVELOPMENT OF A NEW DYNAMIC MASS SPECTROGRAPH Ph.D. Thesis
Moshe Oron 1976 117 p
Avail: Univ. Microfilms Order No. 76-24018

Efforts were directed toward finding a new charge to mass (q/m) path stability field (analogous to wave length stability path in optical spectrometry), or combination of fields, where (q/m) will be determined by path stability and the velocity by time of flight methods. The resulting spectrometer was an electro-dynamic spectrograph having a (q/m) path stability over the whole range of ions analyzed. This spectrograph and some of the experimental results are described. An optical spectrograph, analogous to ion optical spectrographs, having a space varying index of refraction, is proposed. It is clearly seen here that the analogy serves as a vehicle for transferring solutions from one field to another. A variety of other applications, stimulated by looking at both the ion and light optics, are discussed in the text and appendices. Dissert. Abstr.

N77-13386 Arkansas Univ., Fayetteville.
A COLD-CATHODE SAMPLING ORBITRON IONIZATION VACUUM GAUGE Ph.D. Thesis
Kerry Michael Jackson 1976 158 p
Avail: Univ. Microfilms Order No. 76-26409

Linear response and good sensitivity have been obtained from a cold cathode orbitron consuming only 4 milliwatts of power. The pressure sensitivity and linearity of the cold cathode orbitron have been found to be functions of the distance from the axis of the orbitron to the cold electron emitter. In general, the closer the emitter is to the central anode, the more nearly linear the gage response and the less the sensitivity.
Dissert. Abstr.

N77-13387+ Institut d'Optique Theorique et Appliquee, Paris (France).
IMAGE FORMING BY DIRECT GAMMAGRAPHY ON PHOTOGRAPHIC EMULSIONS BY CODING OPTICAL PROCESSING OF SCINTIGRAPHY IMAGES Final Report [FORMATION D'IMAGES PAR GAMMAGRAPHIE DIRECTE SUR EMULSIIONS PHOTOGRAPHIQUES PAR CODAGE. TRAITEMENT OPTIQUE D'IMAGES DE SCINTIGRAPHIE]
S. Lowenthal May 1975 47 p refs In FRENCH
(Contract DGRST-73-7-1811)
Avail: NTIS HC A03

Holographic gammagraphy consists in recording the incoherent hologram of an object emitting gamma or X-rays. This technique has been used for coding star images and has been extended to nuclear medicine. The image forming by such a system was studied for centric and eccentric Fresnel zones. A device for decoding by incoherent correlation for coherent restitution of the holograms was developed. ESA

N77-13388# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE SELECTION OF THE WORKING RANGE OF A MAGNETIC CORRECTION SYSTEM OF THE KINETIC MOMENT
A. P. Alpatov 1975 6 p refs Transl. into ENGLISH from Kosm. Issled. na Ukraine (USSR), no. 7, 1975 p 87-91
Avail: NTIS HC A02/MF A01; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The magnetic correction system (MCS) was developed for the periodic removal of stored kinetic moments from gyroscopic and inertial actuators used for spacecraft orientation control. A numerical method for achieving optimal MCS operation is discussed. D.M.L.

N77-13389*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN EMPIRICAL STUDY OF SCANNER SYSTEM PARAMETERS
David Landgrebe, Larry Biehl, and William Simmons 1976 49 p refs
(Contract NAS9-14016)
(NASA-CR-151123; LARS-IN-110976) Avail: NTIS HC A03/MF A01 CSCL 14B

The selection of the current combination of parametric values (instantaneous field of view, number and location of spectral bands, signal-to-noise ratio, etc.) of a multispectral scanner is a complex problem due to the strong interrelationship these parameters have with one another. The study was done with the proposed scanner known as Thematic Mapper in mind. Since an adequate theoretical procedure for this problem has apparently not yet been devised, an empirical simulation approach was used with candidate parameter values selected by the heuristic means. The results obtained using a conventional maximum likelihood pixel classifier suggest that although the classification accuracy declines slightly as the IFOV is decreased this is more than made up by an improved mensuration accuracy. Further, the use of a classifier involving both spatial and spectral features shows a very substantial tendency to resist degradation as the signal-to-noise ratio is decreased. And finally, further evidence is provided of the importance of having at least one spectral band in each of the major available portions of the optical spectrum.
Author

N77-13390*# Ball Bros. Research Corp., Gardena, Calif. Aerospace Div.
VECTOR MAGNETOMETER DESIGN STUDY: ANALYSIS OF A TRIAXIAL FLUXGATE SENSOR DESIGN DEMONSTRATES THAT ALL MAGSAT VECTOR MAGNETOMETER SPECIFICATIONS CAN BE MET Final Report
Donald F. Adams, Ulli G. Hartmann, Lawrence L. Lazarow, J. Owen Maloy, and George W. Mohler Nov. 1976 173 p refs (Contract NAS5-23661)
(NASA-CR-144825) Avail: NTIS HC A08/MF A01 CSCL 14B

The design of the vector magnetometer selected for analysis is capable of exceeding the required accuracy of 5 gamma per vector field component. The principal elements that assure this performance level are very low power dissipation triaxial feedback coils surrounding ring core flux-gates and temperature control of the critical components of two-loop feedback electronics. An analysis of the calibration problem points to the need for improved test facilities.
Author

N77-13391*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FLUID SAMPLING DEVICE Patent Application
David K. Studenick, inventor (to NASA) Filed 19 Nov. 1976 24 p
(NASA-Case-GSC-12143-1; US-Patent-Appl-SN-743249) Avail: NTIS HC A02/MF A01 CSCL 14B

A fluid sampling device is described for selectively sampling multiple fluids including a support frame. A plurality of fluid inlet devices extend through the support frame and each of the fluid inlet devices include a longitudinal aperture extending therethrough. An opening device that is responsive to a control signal selectively opens the aperture for passing the fluid. A closing device that is responsive to another control signal

selectively closes the aperture for terminating further fluid flow.
Author

N77-13392*# Lumin, Inc., Tuscaloosa, Ala.
SPECKLE REFERENCE BEAM HOLOGRAPHIC AND SPECKLE PHOTOGRAPHIC INTERFEROMETRY IN NONDESTRUCTIVE TEST SYSTEMS Interim Report
Hua-Kuang Liu Oct. 1976 24 p refs
(Contract NAS8-31746)
(NASA-CR-150122; LUMIN-121-76) Avail: NTIS HC A02/MF A01 CSCL 14E

The techniques of speckle beam holographic interferometry and speckle photographic interferometry are described. In particular, their practical limitations and their applications to the existing holographic nondestructive test system are discussed.
Author

N77-13393*# Kanner (Leo) Associates, Redwood City, Calif.
SOME RESULTS OF THE FLIGHT TESTING OF THE ONBOARD EQUIPMENT OF THE MMR-06 METEOROLOGICAL ROCKET
G. A. Kokin and V. Ya. Rusina Washington NASA Dec. 1976 25 p refs Transl. into ENGLISH from Trudy tsentral'noy Aerologicheskoy observatorii (Moscow), no. 99, 1971 p 130-146
(Contract NASw-2790)
(NASA-TT-F-17507) Avail: NTIS HC A02/MF A01 CSCL 14B

A description of onboard instrumentation of meteorological rocket MMR-06 is given. The methods of obtaining temperature, pressure and wind data are described. Some results of these parameters obtained during flight tests of onboard instrumentation are presented. The material is presented with a mathematical interpretation of the methods. A brief comparison with previous experiments is included.
Author

N77-13394# National Aerospace Lab., Amsterdam (Netherlands). Div. Structures and Materials.
THE SCRATCH STRAIN GAGE AS A FATIGUE DAMAGE MONITORING SYSTEM
A. Nederveen 16 Jun. 1975 30 p In DUTCH; ENGLISH summary
(NLR-TR-75094-U) Avail: NTIS HC A03/MF A01

Test results of the Prewitt scratch strain gage and the Technology Inc. strain history recorder are presented. Laboratory tests of both strain gages are presented and flight tests of a military wing structure with the Prewitt gage only are discussed. It is concluded that scratch gages are not suitable for the collection of data to be used in fatigue damage calculations mainly because of the difficulty of reading and interpreting strain records. ESA

N77-13395# Laboratorio di Ricerca e Technologia per lo Studio del Plasma nello Spazio, Frascati (Italy).
POSITION SENSORS [SENSORI DI POSIZIONE]
Valter DalBosco Nov. 1974 30 p ref In ITALIAN
(LPS-74-30) Avail: NTIS HC A03/MF A01

A distance-to-voltage transducer to be used for sensing the position of a low temperature, magnetically suspended aluminum cylinder in the vacuum during a gravitational experiment is presented. Its operational principles are detailed. The electronics and its calibration are described. The performance characteristics such as linearity and stability of this instrument were calculated and agree with experimental results. ESA

N77-13396# Laboratorio di Ricerca e Technologia per lo Studio del Plasma nello Spazio, Frascati (Italy).
MEASUREMENT OF THE EQUIVALENT CIRCUIT PARAMETERS OF A GRAVITATIONAL ANTENNA [MISURA DEI PARAMETRI DEL CIRCUITO EQUIVALENTE DI UNA ANTENNA GRAVITAZIONALE]
F. Bordoni, G. V. Pallottino, and G. Pizzella Jan. 1976 16 p refs In ITALIAN
(LPS-76-1) Avail: NTIS HC A02/MF A01

The sensitivity of a gravitational antenna was investigated studying the parameters of an equivalent circuit. The equivalent circuit parameters were analyzed in two distinct cases: external voltage generator and internal voltage generator. Experimental results carried out at ambient temperatures, at 4.2 and 1.25 K, using two piezoelectric ceramics of the Vernitron BSG-1 type in parallel are compared to theoretical results and discussed. ESA

N77-13397# Explosives Research and Development Establishment, Waltham Abbey (England).
THE RHEOMETRICS MECHANICAL SPECTROMETER: CHARACTERISATION OF HTPB GUMSTOCKS BY VISCOMETRY AND ECCENTRIC ROTATING DISC RHEOMETRY
R. Stenson Dec. 1975 24 p refs
(ERDE-TR-229; BR52639) Avail: NTIS HC A02/MF A01

A new and versatile rheometer, the rheometrics mechanical spectrometer, is described and one application to characterize the rheological properties of HTPB (hydroxy-terminated polybutadiene) gumstocks is demonstrated. Viscosity changes during cure are measured by cone and plate, and parallel plates by later stages of cure, when viscosity is approacing infinity, are monitored by the eccentric rotating disk mode. Dynamic moduli are calculated, and the time to full cure at 60 C is determined for formulations containing up to 50% added inert plasticizer (isodecyl pelargonate). This rheometer is being installed to examine the dynamic rheological properties of solid propellants, inhibitor and motor insulation materials, and adhesives and polymers in general.
Author (ESA)

N77-13398# Royal Aircraft Establishment, Farnborough (England).
THE REDUCTION OF BASE STRAIN SENSITIVITY OF A TRIAXIAL ACCELEROMETER BY THE USE OF A MOUNTING PAD
M. S. Powell Sep. 1975 20 p refs
(RAE-TM-IT-157; BR50143) Avail: NTIS HC A02/MF A01; HMSO; PHI

Reduction of the base strain sensitivity of a triaxial piezoelectric accelerometer by the use of lightweight mounting pads of varying design was investigated for use in the measurement of vibration levels in aircraft instrument panels for a strain of 250 micro strain. Test procedures for the measurement of base strain sensitivity followed the recommended practice of the Instrument Society of America. A reduction in base strain sensitivity of 26 times was obtained for the best strain relieving mounting pad. The reduction in operating frequency range resulting from the use of the mounting pad was also investigated.
Author (ESA)

N77-13399# Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).
DEVELOPMENT OF AN INFRARED GAS SPECTROMETER BASED ON THE BIFREQUENCY PRINCIPLE, FOR AUTOMATIC AND CONTINUOUS ANALYSIS OF GASEOUS EMISSIONS Final Report
Joachim Marckmann Bonn Bundesmin. fuer Forsch. u. Technol. Jun. 1976 70 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-22; BMFT-NTO-36) Avail: NTIS HC A04/MF A01; ZLDI, Munich, DM 14,30

The dispersive infrared-analyzer developed quantitatively scans the concentration of a sample gas component by measuring the absorption as a characteristic infrared band of the sample relative to the background absorption at a reference frequency. The instrument sequentially scans the concentration of up to four components within the spectral range from 4150/cm to 1000/cm. The spectral range may be modified by the exchange of different gratings and detectors. The optical layout allows the use of different infrared liquid cells and special accessories as well as of longpath gas cells. The system is completed by the gas probe with heated coarse and fine gas filters, heated gas tubings, and a gas pump.
Author (ESA)

N77-13400# Siemens A.G., Nuremberg (West Germany). Zentrale Fertigungsabteilung.
DEVELOPMENT OF A PRODUCTION TECHNOLOGY FOR HALL GENERATORS WITH EVAPORATED InSb AND InAs FILMS Final Report
Helmut Freller Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 65 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-29) Avail: NTIS HC A04/MF A01; ZLDI, Munich, DM 13.25

A production technology for Hall probes was developed involving the evaporation of heteroepitaxial InAs and InSb thin films on semi-insulating GaAs or sapphire substrates, division of the films into useful Hall system configurations, and evaporation and evaluation of different contact material combinations. With the aid of this technology, InAs Hall probes in particular can be produced with properties which are superior to commercial thin film Hall probes. With respect to sensitivity and resistance to thermal shocks, they surpass considerably bulk material Hall probes. The relatively high prices of semi-insulating GaAs and sapphire restrict the application of Hall probes to special uses.
Author (ESA)

N77-13401# Institut Franco-Allemand de Recherches, St. Louis (France).
RESEARCH AND DEVELOPMENT OF AN EQUIPMENT FOR CINERADIOGRAPHY [ETUDE ET REALISATION D'UN EQUIPEMENT DE CINERADIOGRAPHIE]
F. Jamet, F. Hatterer, and R. Charon 11 Apr. 1975 14 p refs In FRENCH
(ISL-R-113/75) Avail: NTIS HC A02/MF A01

A flash-radiography installation for recording six high speed motion pictures and short time intervals between two pictures is described. The equipment, including six flash radiography instruments, generates pulsed radiation of ns duration, the tube voltage maximum value being 300 kV. The flash radiography tubes are connected to the high voltage impulse generators by coaxial cables. This configuration allows approach of the X-ray sources and observation with negligible parallax. The time interval impulse X-ray signal synchronization was measured with a + or -5 ns accuracy. Some examples are shown for the recording of shaped charge jets.
ESA

N77-13402# Institut Franco-Allemand de Recherches, St. Louis (France).
RELIABILITY OF A NEW VELOCITY MEASUREMENT METHOD FOR GASES: THE LASER VELOCIMETRY Ph.D. Thesis - Conservatoire Natl. des Arts et Metiers [CONTRIBUTION A L'ETUDE DE LA FIABILITE D'UNE NOUVELLE METHODE DE MESURE DE VITESSES DANS UN ECOULEMENT GAZEUX: LA VELOCIMETRIE LASER]
Germain Koerber 13 Dec. 1975 167 p refs In FRENCH
(ISL-R-132/75) Avail: NTIS HC A08/MF A01

The experimental results for various types of flow studied by laser velocimetry are presented. Subsonic and supersonic flows (turbulent or nonturbulent) as well as free jets were studied, and the results compared with hot wire anemometer measurements. The correlation between both types of measurement are discussed to assess the reliability of the laser velocimetry method.
ESA

N77-13403# California Dept. of Transportation, Sacramento.
CALIBRATION STANDARDS FOR NUCLEAR GAGES: DENSITY AND MOISTURE STANDARDS Final Report
David R. Castanon, Ellsworth Chan, Jerry C. Chang, J. B. Hannon, and Raymond A. Forsyth Dec. 1975 64 p refs
(PB-253170/5; CA-DOT-TL-2908-3-75-30; Rept-632908) Avail: NTIS HC $4.50 CSCL 14B

A search for suitable materials to serve as calibration standards for nuclear moisture density gages was undertaken. A series of six blocks was fabricated for these standards. Each standard consisted of stone from a separate source. Three were quarried and cut to suitable size from stone, and three were cast of Portland cement and selected natural aggregate from separate sources. These were chosen as the calibration standards for all nuclear density gages. The use of standardized blocks improved accuracy, uniformity, and flexibility. Monetary savings are attributed to this procedure.
GRA

N77-13404# Pennsylvania State Univ., University Park. Applied Research Lab.
THE SPECIFICATION, DESIGN AND IMPLEMENTATION OF THE INTERFACE SYSTEM FOR A COLOR DISPLAY SYSTEM M.S. Thesis
Stephin L. McGregor 16 Mar. 1976 129 p refs
(Contract N00017-73-C-1418)
(AD-A026201; TM-76-58) Avail: NTIS HC A07/MF A01 CSCL 08/6

The overall goal for this project was 'to develop, install and evaluate a color display system at the Office of Remote Sensing of Earth Resources at The Pennsylvania State University'. Initial goals were based on three criteria: (1) flexibility, (2) add-on capability, and (3) man-machine interaction.
GRA

N77-13405# ARO, Inc., Arnold Air Force Station, Tenn.
APPLICATION OF A TWO-COMPONENT BRAGG-DIFFRACTED LASER VELOCIMETER TO TURBULENCE MEASUREMENTS IN A SUBSONIC JET Final Report, Jul. 1973 - May 1975
D. O. Barnett and T. V. Giel, Jr. AEDC May 1976 100 p refs
(ARO Proj. RF411-12YA; ARO Proj. R32P-52A)
(AD-A025355; ARO-ETF-TR-75-116; AEDC-TR-76-36) Avail: NTIS HC A05/MF A01 CSCL 14/2

Laser velocimeter (LV) and hot-wire measurements of turbulence parameters in an isothermal subsonic jet are compared for axial locations up to 40 nozzle diameters downstream of the nozzle exit. Data are presented for the mean axial and radial velocities, axial and radial turbulence intensities, Reynolds stresses, and velocity probability densities. The LV used was a two-component, Bragg-diffracted, individual realization system. Since the flow was unseeded, the measurements relied on naturally occurring flow contaminants to serve as a tracer for the LV system. The LV stress measurements are believed unique in that they are derived from cross-correlation of simultaneous measurements of the axial and radial velocities. Comparisons of the LV results with the hot-wire data show anomalies in the mean radial velocities and turbulence intensities for axial locations less than 10 nozzle diameters downstream. Farther downstream these anomalies vanish, and the two instruments are in good agreement. Those factors influential to the accuracy of the LV results, such as optical alignment, statistical confidence and bias, particle dynamic behavior, and the error characteristics of the LV system, are discussed in light of the results.
Author (GRA)

36 LASERS AND MASERS

Includes parametric amplifiers.

N77-13406 British Library Lending Div., Boston Spa (England).
THE LASER PRINTER
E. Catier Mar. 1976 23 p Transl. into ENGLISH from Automatique et Informatique Ind. (France), v. 34, no. 2, 1975 p 51-57
(BLL-Trans-3352-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.

A new data storage technique, COM (computer output microfilming) along with some principles of acousto-optics, are presented. In the COM system a helium-neon laser tube which emits a red beam with a wavelength of 0.6328 microns reproduces the characters on films by profiling the electron beam through characters and symbols cut individually out of a metal matrix. The beam excites the phosphorus on the screen in the very shape of the characters selected. An acousto-optical system in the optical path deflects the beam to write the characters and compose the pages. When a film with dry development is used, the adequate power of the laser beam is bracketed between 2 and 5 milliwatts.
I.M.

N77-13407 Ohio State Univ., Columbus.
DF AND HF LASER SPECTRA IN THE INFRARED Ph.D. Thesis
William Bernie Heath 1976 134 p
Avail: Univ. Microfilms Order No. 76-24610

A chemical laser was built to study, under high resolution, the infrared spectra of the DF/HF laser. The laser was a low power, pulsed type using sulfur hexafluoride and deuterium or hydrogen as the active gases. Vibrationally excited DF/HF was produced by the chemical reaction of D2/H2 and atomic fluorine. The fluorine was dissociated from SF6 by an electrical discharge. The laser and absorption data were combined with other available data from the literature to calculate a set of molecular constants for DF. Likewise, the HF laser data was used with other published

HF data to determine a set of molecular constants for that molecule. In an attempt to ascertain the validity of the isotopic relationship, the spectra positions of the DF lines were predicted from the molecular constants calculated for HF. These values were then compared with the observed values of DF.
Dissert. Abstr.

N77-13408*# Miami Univ., Coral Gables, Fla. Lab. for Optics and Astrophysics.
LASER APPLICATION TO MEASURE VERTICAL SEA TEMPERATURE AND TURBIDITY, DESIGN PHASE
Joseph G. Hirschberg, A. W. Wouters, K. M. Simon, J. D. Byrne, and C. E. Deverdun Jan. 1976 123 p refs
(Contract NAS10-8795)
(NASA-CR-144854) Avail: NTIS HC A06/MF A01 CSCL 20E

An experiment to test a new method was designed, using backscattered radiation from a laser beam to measure oceanographic parameters in a fraction of a second. Tyndall, Rayleigh, Brillouin, and Raman scattering all are utilized to evaluate the parameters. A beam from a continuous argon ion laser is used together with an interferometer and interference filters to gather the information. The results are checked by direct measurements. Future shipboard and airborne experiments are described. Author

N77-13409# Institut Franco-Allemand de Recherches, St. Louis (France).
PARAMETRIC INVESTIGATION OF A CO2 LASER WITH A NONAUTONOMOUS DISCHARGE PREIONIZED BY AN ELECTRON BEAM [PARAMETRISCHE UNTERSUCHUNG EINES CO2-LASERS MIT EINER ELEKTRONENSTRAHLVORIONISIERTEN UNSELBSTAENDIGEN ENTLADUNG]
M. Hugenschmidt and K. Vollrath 6 Sep. 1974 23 p refs In GERMAN
(Contract T/R-780/R-7800/41088)
(ISL-34/74) Avail: NTIS HC A02/MF A01

A small model of a CO2 laser oscillator was parametrically investigated with a view to increasing its specific energy by preionization. Preionization is obtained by injection of an electron beam through a thin Al window, producing secondary plasma electrons, which are then accelerated by an electric field perpendicular to the primary beam. The output laser energy variation as well as the temporal impulse variation as function of the input energy and as function of the gas mixture ratio were investigated. The laser resonator uses a multiply folded ray path. Energy densities of 20 J/l (referred to mode volume) were obtained for a system not optimized with respect to reflection coefficient and relation between active mode volume and discharge volume. ESA

N77-13410# Centre National d'Etudes Spatiales, Toulouse (France).
LUNAR LASER REFLECTORS. PRELIMINARY STUDY OF LASER REFLECTOR THERMAL CONTROL [REFLECTEURS LASER LUNAIRES. ETUDE PRELIMINAIRE DU CONTROLE THERMIQUE D'UN REFLECTEUR LASER]
Philippe Mauroy May 1976 23 p In FRENCH; ENGLISH summary
(CNES-NT-36) Avail: NTIS HC A02/MF A01

The possibility was investigated of using passive thermal control to obtain a maximum diurnal temperature of 100 C and a minimum nocturnal temperature of -70 C on a hollow laser reflector deposited on the moon. The facets of the reflector are basically constituted by specular aluminized Sital. Two solutions were studied: one in which the internal faces are covered with a second surface mirror type coating, and another in which the internal faces are not coated, the aperture of the reflector being closed by a thin glass plate. It was concluded that both solutions were viable, the first one being preferable because it is technologically feasible and simpler than the other from a mechanical point of view. Author (ESA)

N77-13411# United Technologies Research Center, East Hartford, Conn.
HIGH-POWER INFRARED WAVEGUIDE MODULATORS Semiannual Technical Report, Sep. 1975 - Mar. 1976
P. K. Cheo, D. Fradin, M. Gilden, and R. Wagner 30 Mar. 1976 78 p refs
(Contract N00014-73-C-0087; ARPA Order 1860)
(AD-A025418; UTRC/R76-922241-3; SATR-7) Avail: NTIS HC A05/MF A01 CSCL 20/6

The objective of this program is to develop an efficient and reliable ultrawideband waveguide modulator for CO2 lasers that will be useful for high resolution, imaging optical radars and high-data-rate optical communication systems. Efficiency and reliability are obtainable by using integrated optics technology. During this report period (September 1975 to March 1976), major objectives are (1) to obtain the sideband power at a frequency 16 GHz offset from a CO2 laser V-R transition greater than 10 mW, (2) to obtain a modulation bandwidth exceeding 500 MHz, (3) to obtain a good transmitted optical beam quality, and (4) to establish an optimum waveguide modulator configuration and define the operational capabilities and limitations of this modulator. These research and development efforts are essential for making an accurate assessment of active infrared waveguide devices that shall lead to a rational decision regarding the advisability of initiating a high-power infrared waveguide modulator brassboard development program. GRA

N77-13412# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
EDL PERFORMANCE MODEL PART 3: ANALYSIS OF CLOSED CYCLE ELECTRON-BEAM SUSTAINED CO2 EDL WITH AIR CONTAMINANT Technical Report, 16 Jul. 1975 - 10 May 1976
Jurgen Thoenes and Shelby C. Kurzius May 1976 102 p refs
(Contract DAAH03-75-A-0040)
(AD-A025404; LMSC-HREC-TR-D496800-Pt-3; RG-CR-75-2-Pt-3) Avail: NTIS HC A06/MF A01 CSCL 20/5

A computer model has been developed and applied to evaluate the characteristics of continuously flowing CO2 electron-beam sustained electric discharge lasers. The model contains a detailed treatment of the cavity flow, finite rate excitation-relaxation kinetics, electron beam and electric discharge including the effects of gas recirculation and air contamination. Wave propagation is treated with a two-dimensional Fresnel integral method allowing laser radiation to interact with the flowing gain medium. Predicted performance levels show generally good agreement with experimental results. Author (GRA)

N77-13413# Naval Postgraduate School, Monterey, Calif.
LASER EFFECTS HANDBOOK. 3: LASER ABSORPTION WAVE PHENOMENA Interim Report, 1972 - 1974
Don E. Harrison, Jr. and John R. Neighbors Dec. 1975 62 p refs
(AD-A024834; NPS-61NB75121) Avail: NTIS HC A03/MF A01 CSCL 20/5

Possible plasma ignition mechanisms as a result of laser irradiation are listed and individually discussed. Experimental evidence is cited when available. A qualitative discussion of the transition process is given and one dimensional laser supported absorbtion waves are discussed. Author (GRA)

N77-13414# Battelle Columbus Labs., Ohio.
EXPLORATORY DEVELOPMENT OF LASER-HARDENED MATERIALS AND MEASUREMENT OF LASER BEAM PARAMETERS AND MATERIAL RESPONSE TO HIGH-POWER LASER RADIATION, VOLUME 1 Final Report, 15 Mar. 1973 - 31 Aug. 1975
C. T. Walters, R. E. Beverly, III, and T. J. Negrelli Wright-Patterson AFB, Ohio AFML Dec. 1975 111 p
(Contract F33615-73-C-5045; AF Proj. 7360)
(AD-A026831; AFML-TR-75-183-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 20/6

This three-volume report summarizes research efforts undertaken in a two-year research program to develop two laboratories at AFML for studies of the interaction of high-power CO2 laser beams with materials of interest to the USAF. In Volume I, various elements of the laboratories developed by Battelle are discussed, including systems for beam transport, event sequencing, safety control, irradiation timing, alignment, target air flow, data acquisition, data reduction, and laser beam mapping. Target diagnostic techniques are also described in Volume I. Volume II contains Appendices A-E which present detailed schematics, listings, and drawings for some of the laser

laboratory systems. Volume III contains Appendix F (classified) which presents a new concept for hardening materials to laser radiation. GRA

N77-13415# Battelle Columbus Labs., Ohio.
EXPLORATORY DEVELOPMENT OF LASER-HARDENED MATERIALS AND MEASUREMENT OF LASER BEAM PARAMETERS AND MATERIAL RESPONSE TO HIGH-POWER LASER RADIATION. VOLUME 2: APPENDICES A-E Final Report, 15 Mar. 1973 - 31 Aug. 1975
C. T. Walters, R. E. Beverly, III, and T. J. Negrelli Wright-Patterson AFB, Ohio AFML Dec. 1975 139 p
(Contract F33615-73-C-5045; AF Proj. 7360)
(AD-A026915; AFML-TR-75-183-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 20/5

This three-volume report summarizes research efforts undertaken in a two-year research program to develop two laboratories at AFML for studies of the interaction of high-power CO2 laser beams with materials of interest to the USAF. In Volume I, various elements of the laboratories developed by Battelle are discussed. Volume II contains Appendices A-E which present detailed schematics, listings, and drawings for some of the laser laboratory systems. Appendix A. Wiring Diagrams for LCL Control Console and EAL Timing Shutter Electronics; Appendix B. NLCL Event Sequencer Schematic Diagrams; Appendix C. NLCL Safety Control Panel Schematic Diagrams; Appendix D. Software for NLCL Data Acquisition System; Appendix E. Detail Drawings for Vacuum irradiation system. Author (GRA)

N77-13416# Atlantic Research Corp., Alexandria, Va.
ADVANCED H2-HCl GAS DYNAMIC LASER, PHASE 2 Final Technical Report, Apr. - Dec. 1975
Jan. 1976 152 p refs Prepared jointly with Physical Sciences Inc., Wakefield, Mass.
(Contract DAAH01-75-C-0789)
(AD-A025357; ARC-47-5655) Avail: NTIS HC A08/MF A01 CSCL 20/5

The initial phase of this work was a feasibility study of an H2 - HCl mixing gas dynamic laser. The results of that study indicated that a high energy laser system based on the H2 - HCl system was indeed feasible. This laser device concept envisions the use of a solid propellant to generate high temperature H2 - HCl mixtures which are expanded supersonically to create the proper conditions for efficient H2 to HCl V to V transfer and lasing on HCl. This type of laser device has several significant potential advantages as a high energy device for military application, i.e., the use of compact, field storable solid fuel technology, high specific power (80 - 100 Kj/lb), and lasing of HCl in the 4.0 micrometer atmospheric window. The objective of the current phase was to experimentally verify the V - V and V - T kinetics for the important H2 - HCl processes and to develop solid propellant gas generators that could be used to generate the required gases at attractive weight yields. The results of the current phase have verified that the kinetics are capable with operation of a H2 - HCl laser. In addition, the gas generator development program has succeeded in producing the required gases at weight yields that make the system attractive for Army field application. GRA

N77-13417# Hughes Research Labs., Malibu, Calif.
COAT/TARGET-SIGNATURE INTERACTIONS Interim Report, 1 Aug. - 31 Oct. 1975
M. E. Pedinoff, S. A. Kokorowski, and J. E. Pearson Apr. 1976 76 p refs
(Contract F30602-76-C-0021; ARPA Order 1279)
(AD-A026258; RADC-TR-76-64) Avail: NTIS HC A05/MF A01 CSCL 17/8

Target speckle modulation effects have been investigated experimentally using a number of scaled realistic targets with different shapes and surface textures, and analytically using theoretical target signature models in a computer simulation model of a multidither COAT system. The experimental results have shown that maximum contrast ratios of 0.79 can occasionally be obtained, but that the average is much lower. Significant receiver aperture integration effects cause reduction of the contrast ratio. Temporal frequency spectra obtained by rotation of the targets agree with spatial frequency data obtained by fast Fourier transform processing of the target signature data. Preliminary computer simulation results using high contrast ratio speckle data from GRC show degraded COAT system performance. A preliminary adjustment of the COAT simulation model has led to reduced susceptibility to high contrast speckle modulation. In addition, theoretical arguments, corroborated by the experimental results, indicate that such high contrast ratios are not realistic at visible wavelengths. GRA

N77-13967 European Space Agency, Paris (France).
CO2 LASER AMPLIFICATION IN AN ELECTRON-BEAM CONTROLLED DISCHARGE
Jean Bonnet *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 74-90 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 45-53 Original report in FRENCH previously announced as A76-28755 (For primary document see N77-13962 04-99)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N77-13418* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SMOKE GENERATOR Patent
James R. Rogers, inventor (to NASA) Issued 9 Nov. 1976 11 p Filed 1 Oct. 1975 Supersedes N75-33278 (13 - 24, p 3031)
(NASA-Case-ARC-10905-1; US-Patent-3,990,987; US-Patent-Appl-SN-618594; US-Patent-Class-252-359A; US-Patent-Class-219-300; US-Patent-Class-219-304; US-Patent-Class-239-171) Avail: US Patent Office CSCL 13K

A smoke generator is disclosed which is particularly suitable for mounting on the wing tips of an aircraft and for conducting airflow studies. The device includes a network of thermally insulated tubes for carrying a fluid which is used to produce smoke. The fluid, which need not be combustible, is heated above its vaporization temperature by electric current which is passed through the fluid conduit tubes, so that the tubes serve both as fluid conduits and resistance heating elements. Fluid supply and monitoring systems and electrical control systems are also disclosed. Official Gazette of the U.S. Patent Office

N77-13419 Iowa Univ., Iowa City.
OPTIMAL DESIGN OF MECHANICAL SYSTEMS WITH INTERMITTENT MOTION Ph.D. Thesis
Ray-Chong Huang 1976 92 p
Avail: Univ. Microfilms Order No. 76-26294

The optimal design of mechanical systems which exhibit intermittent motion is studied. Sensitivity of cost and constraint functions to changes in design are obtained by applying theorems from the calculus of variations and by using first order approximations of functions appearing in the problem. A steepest descent method is used to obtain the optimum solution. The general method developed is applied to a one degree of freedom vibration absorber, and to a three degree of freedom multi mass, cammed mechanical system. Numerical results for these problems are presented and discussed. Dissert. Abstr.

N77-13420 Iowa Univ., Iowa City.
MECHANICAL DESIGN OPTIMIZATION FOR TRANSIENT DYNAMIC RESPONSE Ph.D. Thesis
Ming-Hsu Hsiao 1976 109 p
Avail: Univ. Microfilms Order No. 76-26292

A technique for mechanical design optimization with constraints on transient dynamic response is developed through application of optimal design theory and functional analysis. Cost and constraint functions involving the state variables, design parameters, and environmental parameters are first formulated as extreme value functionals. The cost function is a linear combination of extreme dynamic responses of the mechanical system and constraints are imposed on certain extreme responses. Three equivalent problem formulations are employed to reduce

the extreme value functionals to more elementary functional forms. A generalized steepest descent method with constraint error compensation is used to solve the reduced optimization problem. Dissert. Abstr.

N77-13421 Texas Univ., Austin.
DESIGN OF MECHANICAL COMPONENTS USING OPTIMAL CONTROL Ph.D. Thesis
Michael Don Biggs 1976 111 p
Avail: Univ. Microfilms Order No. 76-26595

Two uses of computer, control of equipment and problem solving were combined to present a new design technique for mechanical components. New design techniques are presented in sufficient detail for the designer to determine applicability to his particular problem. Necessary hardware and software are described, and possible problem areas and solutions are discussed. Experimental work was performed to demonstrate the feasibility of the technique and to verify the problem areas and examine their solution. Dissert. Abstr.

N77-13422 CIT Compagnie Industrielle des Telecommunications, Bruyeres-le-Chatel (France).
RADIAL TURBINE FOR SPECIAL TURBOCOMPRESSORS Final Report [ETUDE ET REALISATION D'UNE TURBINE RADIALE POUR TURBOCOMPRESSEURS SPECIAUX]
Jean Friberg and Jean-Marie Merigoux 1975 35 p In FRENCH
(Contract DGRST-72-7-0594)
(M8.510.75.113) Avail: Issuing Activity

A radial turbine was developed for replacing two axial flow turbines in the applications of special turbocompressors with high compressor efficiency as well as in small gas turbines. The results obtained in a given geometry are an expansion rate of 4.30 at an output of 6.0 kg/s, a turbocompressor efficiency of 0.80, and a radial turbine efficiency of 0.85. In addition, a generalized diagram was developed for radial turbines. ESA

N77-13423 Lyon Univ. (France). Lab. de Technologie des Surfaces.
EFFECT OF THE LOAD IN A CONTACT WITH BOUNDARY LUBRICATION Final Report [INFLUENCE DE LA CHARGE DANS UN CONTACT SOUS LUBRIFICATION LIMITE]
J. M. Georges, B. Lamy, M. Daronnat, and S. Moro Apr. 1975 80 p refs In FRENCH
(Contract DGRST-72-7-0606)
Avail: Issuing Activity

The effect of the transition load on the wear in a contact with boundary lubrication was investigated. An experimental method was developed for this purpose, and parameters affecting the boundary lubrication under industrial operating conditions were identified. These parameters are the adsorbed boundary film, the contact microgeometry (surface roughness), macrogeometry, and hardness of materials used. It was found that the curve of the tops of the surface protrusion affect the transition load, and thus the boundary lubrication. The transition load also depends on the chemical nature of the contact and its geometrical and mechanical aspects. ESA

N77-13424+ Centre Technique des Industries Mecaniques, St. Denis (France). Lab. de la Turbine a Gaz.
EXPERIMENTAL EXAMINATION OF TURBOMACHINE BLADE PROFILES Final Report [VERIFICATION EXPERIMENTALE DES CARACTERISTIQUES DE PROFILS D'AUBES DE TURBOMACHINES]
Michel Pluviose Oct. 1975 61 p refs In FRENCH
(Contract DGRST-73-7-1247)
Avail: NTIS HC A04

In order to compare theoretical and experimental results in axial turbomachine blade cascades, it is necessary to experimentally reduce the wall detachment. A blowing device was constructed for boundary layer control fitted downstream of the cascade under test, providing an energy addition to the fluid near the walls, thus avoiding the massive flow detachment generally produced in compressor blade cascades. A two-dimensional flow is established allowing tests to be made. ESA

N77-13425# National Aviation Facilities Experimental Center, Atlantic City, N.J.
NONRIGID BARRIER DESIGN FOR ASSESSMENT OF AUTOMOBILE AGGRESSIVENESS Final Report, Jan. - Sep. 1975
William M. Perrella, Jr. Sep. 1976 25 p refs
(AD-A029849/7; FAA-NA-76-27) Avail: NTIS HC A02/MF A01 CSCL 13/6

Crash testing of automobiles to improve safety features is dominated by crash tests against a flat stationary barrier. Such tests do not effectively measure the characteristic known as vehicle aggressiveness. An aggressive automobile may, in the flat barrier impact test, provide a high level of protection for its own occupants. In a two-car collision, such a vehicle may render the survival of the occupants of the other car difficult or impossible to achieve. There are three types of aggressiveness: architectual aggressiveness, such as a very stiff bumper or fender; mass aggressiveness, such as an engine located in such a way that on impact with the struck car it will produce lethal penetration; and structural aggressiveness, where the overall structure of the vehicle is much stiffer than that of the struck car, thus forcing it to absorb most of the crash energy. A moving nonrigid crash barrier was designed to assess vehicle aggressiveness and crash survivability. Author

N77-13426*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AUTOMOTIVE GAS TURBINE FUEL CONTROL Patent Application
H. S. Gold, inventor (to NASA) Filed 8 Nov. 1976 28 p
(NASA-Case-LEW-12785-1; US-Patent-Appl-SN-739909) Avail: NTIS HC A03/MF A01 CSCL 21E

A fuel control useful for automotive-type gas turbines and particularly advanced gas turbines utilizing variable geometry components to improve mileage and reduce pollution emission is disclosed. The fuel control described compensates for fuel density variations, inlet temperature variations, turbine vane actuation, acceleration, and turbine breaking. These parameters are utilized to control various orifices, spool valves and pistons in a desired manner. NASA

N77-13427# European Space Agency, Paris (France).
PREQUALIFICATION TESTS OF HEAT RESISTING LUBRICANTS
Francis Reynaud Oct. 1976 42 p refs Transl. into ENGLISH of 'Essais de Prequalification d'une Huile Haute Temp.', ONERA, Paris Report ONERA-NT-1975-12, 1975
(ESA-TT-330; ONERA-NT-1975-12) Avail: NTIS HC A03/MF A01

Research tests designed to estimate the potential of high-temperature lubricants are proposed. In this evaluation procedure, restricted to only the most mandatory of existing requirements, the following hypotheses were adopted: (1) the oil must be used in a mixed system, that is, one comprising a recirculatory sector (least exposed shaft bearings, drive pinions to ancillary components) and a lost oil sector (supply to the most exposed rear bearing); (2) temperatures are of the order of 260 to 300 C (tank) and 300 to 350 C (bearing, hot zones) in the recirculated-oil sector, and 400 C (supply system) and 450 to 500 C (bearing) in the lost-oil sector. Author (ESA)

N77-13428# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flugsimulation.
DESIGN OPTIMIZATION OF SERVO SYSTEMS WITH DIGITAL, ANALOG OR SYNCHRO INPUT SIGNALS
Friedrich Erdmann, Eckhard Biertuempel, and Guenter Bunge 8 Jul. 1976 37 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-339)
(DLR-FB-76-37) Avail: NTIS HC A03/MF A01; DFVLR, Cologne, DM 19,80

A method of optimal dimensioning for electromechanical, velocity-controlled servo-systems with digital, analog or 3-phase (synchro) input signals is presented. It is assumed, that the maximum error for a maximum constant velocity is given. Formulas are developed via a mathematical model for this purpose. An example is given for verifying and demonstrating the theories developed, for each of the three types of servo-systems.
Author (ESA)

N77-13429# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
DESIGN CRITERIA FOR ELASTOMERIC BEARINGS, VOLUME 1 Final Report
Mar. 1976 268 p refs 4 Vol.
(Contract DAAJ02-73-C-0091; DA Proj. 1F1-62205-A-119)
(AD-A024766; USAAMRDL-TR-75-39-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 13/9

The contract with the Eustis Directorate included the evaluation, development, and selection of analytic and experimental techniques required for the design and/or evaluation of elastomeric bearings for rotor head applications. Axially laminated cylindrical (Type I), radially laminated cylindrical (Type II), and spherical laminated (Type III) bearings were considered. This report reviews three major areas of development: (1) the development and selection of experimental procedures for the determination of required design and analysis parameters, (2) the evaluation and definition of predictive techniques for stability of buckling of laminated bearings, and (3) the development of procedures for predicting the service life of bearings. The products of this effort are a finite-element computer code and a first edition of a design manual. Author (GRA)

N77-13430# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
DESIGN CRITERIA FOR ELASTOMERIC BEARINGS. VOLUME 2: DESIGN MANUAL Final Report
Suresh B. Kulkarni Mar. 1976 188 p refs 4 Vol.
(Contract DAAJ02-73-C-0091; DA Proj. 1F1-62205-A-119)
(AD-A024767; USAAMRDL-TR-75-39B-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 13/9

This design manual contains the recommended analytical approaches and engineering procedures to be followed by designers of elastomeric bearings for rotor head applications in helicopters. Three bearing configurations, namely, axially laminated cylindrical (Type I), radially laminated cylindrical (Type II), and spherical laminated (Type III) bearings are considered. Several levels of design analysis are presented: closed-form operations, computer-developed design curves, and finite-element computer analysis. The design restraints determined by stability and service life are also considered. The material properties required for the design and the suggested experimental methods for their determination are also discussed. Author (GRA)

N77-13431# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
DESIGN CRITERIA FOR ELASTOMERIC BEARINGS. VOLUME 3: PROGRAM USER'S MANUAL Final Report
Don H. Lee Mar. 1976 79 p refs 4 Vol.
(Contract DAAJ02-73-C-0091; DA Proj. 1F1-62205-A-119)
(AD-A024753; USAAMRDL-TR-75-39C-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 13/9

This document describes the usage and input of a program that performs a stress analysis on an axisymmetric body with isotropic materials. The body may have asymmetric loads, in which case several passes through the program are required to obtain the complete solution. The accumulation routine will accumulate all the harmonics of the Fourier expansion. The program is a compressible formulation; that is, Poisson's ratio must be less than .5, but it may be as close to it as desired. An extensive input module has been included in the program to make it as user oriented as possible. This includes routines that will automatically generate bearing geometry based on basic input parameters. The basic program is written in FORTRAN IV with some support routines written in IBM 370 Assembler Language. Author (GRA)

N77-13432# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
DESIGN CRITERIA FOR ELASTOMERIC BEARINGS. VOLUME 4: PROGRAMMER'S MANUAL Final Report
Don H. Lee Mar. 1976 60 p refs 4 Vol.
(Contract DAAJ02-73-C-0091; DA Proj. 1F1-62205-A-119)
(AD-A024754; USAAMRDL-TR-75-39D-Vol-4) Avail: NTIS HC A04/MF A01 CSCL 13/9

This document provides information necessary to the programmer to support and modify program S3359. The general philosophy of the program and detail on some sections are contained herein. Author (GRA)

N77-13433# RCA Labs., Princeton, N.J.
BASIC ADHESION MECHANISMS IN THICK AND THIN FILMS Quarterly Technical Report, 1 Jan. - 31 Mar. 1976
Thomas T. Hitch and Kenneth R. Bube 30 Apr. 1976 34 p refs
(Contract N00019-76-C-0256)
(AD-A026848; PRRL-76-CR-20; QTR-1) Avail: NTIS HC A03/MF A01 CSCL 09/1

The first quarterly report of 1976 reviews the present understanding of gold-platinum thick-film inks, their solderability, and the degradation of adhesion strength of the soldered film caused by thermal aging. In addition, metal powders for the model ink program and some commercially available gold-platinum inks have been chemically analyzed. Specifically, high surface area, e.g., 10 to 15 sq m/gm, platinum and palladium powders were obtained, analyzed by flame emission spectroscopy and characterized in terms of particle size distribution and morphology. Additional MB-1 gold powder was analyzed as well. Isothermal densification curves were determined for the gold, platinum and palladium powders as well as isothermal weight-gain (oxidation) curves for the palladium powder. The weight gain indicated the need to sinter palladium-bearing compositions above 800 C to preclude oxidation and facilitate rapid densification. All powders were discussed in terms of classical sintering behavior, i.e., neck growth, pore closure, and grain growth. Twenty-two commercial inks were analyzed by x-ray fluorescence spectrometry (XRFS) to identify the gold-platinum-palladium ratios and binding agent elements. Gold-platinum intensity ratios were found to vary about an order of magnitude, and gold-palladium ratios were considerably less than that. Initial soldered adhesion strengths varied by more than a factor of two. After thermal aging at 150 C for 250 hours, about the same ratio existed, but some inks had decreased in strength by more than 50 percent. Chemical analyses of platinum and palladium foil were also completed in preparation for glass frit wetting studies on these materials. Author (GRA)

N77-13434# Norton Co., Worcester, Mass. Industrial Ceramics Div.
FINISHING TECHNIQUES FOR SILICON NITRIDE BEARINGS Final Report, 15 Jan. 1974 - 15 Jul. 1975
H. R. Baumgartner and Paul E. Cowley (Federal Mogul Corp., Ann Arbor, Mich.) Mar. 1976 78 p refs
(Contract DAAG46-74-C-0055)
(AD-A025350; AMMRC-CTR-76-5) Avail: NTIS HC A05/MF A01 CSCL 13/9

Strength, surface finish and rolling contact fatigue life were determined on two grades of hot pressed silicon nitride after a total of twenty-seven different surface finishing procedures. Rolling contact fatigue lives of silicon nitride with selected smoother finishes tested at 800 ksi Hertz stress were an order of magnitude longer than those obtained on the M50 bearing steel controls and more than twice as long as the best results previously obtained on silicon nitride. Author (GRA)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N77-13435# Rome Air Development Center, Griffiss AFB, N.Y.
DEVELOPMENT OF FAILURE-RATE MODELS FOR SEMICONDUCTOR OPTOELECTRONIC DEVICES Final Report, 1 Mar. 1975 - 1 Jul. 1976
Donald B. Ellingham, Jr., William M. Schreyer, and Wolfgang W. Gaertner 1 Jul. 1976 176 p refs
(Contract DOT-FA72WAI-356)
(AD-A029163/3; FAA-RD-76-134) Avail: NTIS HC A08/MF A01 CSCL 09/1

An effort is described to establish prediction techniques for the catastrophic failure rate and for the degradation exhibited by optoelectronic devices such as light emitting diodes, alphanumeric displays, and opto-couplers. The proposed estimation procedures and equations were developed in a format which is compatible with MIL-HDBK-217B. The failure rate equations are

similar to those for germanium diodes in MIL-HDBK-217B, modified to be compatible with all available life test data on optoelectronic devices. The degradation equations for which no analogy exists in other solid state devices were formulated from theoretical considerations and matched to available degradation test data. The prediction techniques cover all presently known optoelectronic devices and are expected to remain valid even though the numerical values for the parameters will change as technology matures and more test data are generated. Author

N77-13436*# National Bureau of Standards, Washington, D.C.
IMPROVED ULTRASONIC STANDARD REFERENCE BLOCKS Interim Report, 1 Jan. - 31 Dec. 1974
D. G. Eitzen, G. F. Sushinsky, D. J. Chwirut, C. J. Bechtoldt, and A. W. Ruff Feb. 1976 88 p refs Sponsored in part by NASA
(Contract F33615-74-M-6752; AF Proj. 7381)
(AD-A026138; NBSIR-75-685; AFML-TR-75-180; NASA-CR-149320) Avail: NTIS HC A05/MF A01 CSCL 14/2

A program to improve the quality, reproducibility and reliability of nondestructive testing through the development of improved ASTM-type ultrasonic reference standards is described. Reference blocks of aluminum, steel, and titanium alloys are to be considered. Equipment representing the state-of-the-art in laboratory and field ultrasonic equipment was obtained and evaluated. RF and spectral data on ten sets of ultrasonic reference blocks have been taken as part of a task to quantify the variability in response from nominally identical blocks. Techniques for residual stress, preferred orientation, and micro-structural measurements were refined and are applied to a reference block rejected by the manufacturer during fabrication in order to evaluate the effect of metallurgical condition on block response. New fabrication techniques for reference blocks are discussed and ASTM activities are summarized. GRA

N77-13437# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
ENVIRONMENTAL FATIGUE CRACK PROPAGATION IN Ti-6Al-4V SHEET
R. J. H. Wanhill 10 Jun. 1976 39 p refs Revised Submitted for publication Sponsored in part by Neth. Agency for Aerospace Programs
(NLR-MP-74023-U-rev) Avail: NTIS HC A03/MF A01

A study was made of environmental fatigue crack propagation in 2.5 mm thick Ti-6Al-4V sheet conforming to AMS 4911, and 2.2 mm thick IMI 318 conforming to BS TA 10. The environments were dry argon, normal air, distilled water, and 3.5 % aqueous NaCl. There were three alloy/orientation combinations: Ti-6Al-4V L-T, IMI 318 L-T, and IMI 318 T-L. Test frequencies were 30 and 50 Hz, at which there was a general trend of higher crack growth rates in the order: argon, air, distilled water, and 3.5 % aqueous NaCl. For both dry argon and 3.5 % aqueous NaCl there were large differences in crack growth rates at low delta values between the three types of specimen. There was a correlation between the texture and cleavage fracture and crack growth rates in 3.5 % aqueous NaCl. This result is of considerable practical importance. For dry argon the ranking of specimen types could be explained by the relative importance of mechanical and environmental crack growth, using the structure-sensitive to structure-insensitive transition concept of Irving and Beevers. Author (ESA)

N77-13438# European Space Agency, Paris (France).
PRODUCT ASSURANCE
Sep. 1976 725 p refs Proc. of a Symp. held in Frascati, Italy, 4-6 May 1976
(ESA-SP-116) Avail: NTIS HC A99/MF A01

Articles are presented on customers' and contractors' views on product assurance, materials, information systems, component parts, systems, reliability/hazard control, and product assurance cost effectiveness. Author (ESA)

N77-13439# Southwest Research Inst., San Antonio, Tex.
NONDESTRUCTIVE TESTING INFORMATION ANALYSIS CENTER: 1975, YEAR OF TRANSITION Annual Technical Report, 15 Feb. 1975 - 15 Feb. 1976
C. G. Gardner May 1976 32 p refs
(Contract DSA900-74-C-5268)
(AD-A024848; SWRI-15-3903(2)) Avail: NTIS HC A03/MF A01 CSCL 05/2

In January 1976 the Department of Defense transferred to Southwest Research Institute full responsibility for operation of the Nondestructive Testing Information Analysis Center (NTIAC), discontinuing the Nondestructive Testing Data Support Center as a separate function. During the reporting period, NTIAC's computerized data file grew to 9,777 records. The NTIAC Newsletter was distributed to 929 recipients, and the Bulletin to 2131 recipients. 75 inquiries (technical, bibliographic, and general) were responded to. A state-of-the-art survey on electromagnetic acoustic transducers was published. Under Air Force sponsorship a Workshop on Nondestructive Evaluation of Residual Stress was conducted, the Proceedings to be published. NTIAC's RDT and E remote terminal was upgraded to secure status, giving NTIAC on-line access to classified records in DDC's TR file. Author (GRA)

N77-13440# Oklahoma State Univ., Stillwater. College of Business Administration.
MONTE CARLO BAYESIAN SYSTEM RELIABILITY-AND MTBF-CONFIDENCE ASSESSMENT Final Report, 1 Mar. 1974 - 31 Aug. 1975
Mitchell O. Locks Dec. 1975 99 p refs
(Contract F33615-74-C-4072; AF Proj. 7071)
(AD-A025820; AFFDL-TR-75-144) Avail: NTIS HC A05/MF A01 CSCL 12/1

This report documents the underlying theory and the usage of computer software for providing both point and interval estimates of the reliability and the MTBF (Mean Time Between Failures) of a large and complex system of any Logical configuration whatsoever. Interval estimation is frequently called assessment. Every component is of one of two types, time-to-failure, subject to a Poisson process, or attribute type, subject to a Bernoulli process. The prior data consists of the system logical configuration information, such as the set of minimal paths of the set of minimal cuts for each module, and for the system as a configuration of independent modules, the failure-history data for every component, and the system mission time. For time-to-failure components, the failure-history data consists of total failures and total accumulated testing time; for attribute components (e.g., failure modes) the data are total accumulated tests and total failures. GRA

N77-13441# Orwin Associates, Inc., West Babylon, N. Y.
RELIABILITY STUDY OF DISPLAY UNITS FOR TACTICAL SUPPORT CENTER Final Report
5 May 1976 126 p refs
(Contract NL2269-76-C-0180)
(AD-A025153) Avail: NTIS HC A07/MF A01 CSCL 09/3

This phase of the Reliability Study Program was initiated to study the documentation, to study one of the Display Units and to make recommendations for circuit changes to improve the reliability of the Display Units. Prior to the start of this study program, a high incidence of failures were occurring in these units, and the overall program plan for the CV-TSC Tactical/Tabular Display System was being jeopardized. It was also apparent at that time that the highest number of failures were occurring in the Horizontal Deflection circuitry and the High Voltage Power Supply Module. GRA

N77-13442# Boeing Commercial Airplane Co., Seattle, Wash.
FURTHER DEVELOPMENT OF RELIABILITY ANALYSIS APPLICATION TO STRUCTURAL FATIGUE EVALUATION Final Report, 15 Feb. 1974 - 15 Oct. 1975
I. C. Whittaker and S. C. Saunders Wright-Patterson AFB, Ohio AFML Jan. 1976 101 p refs
(Contract F33615-74-C-5037; AF Proj. 7351; AF Proj. 1367)
(AD-A025365; AFML-TR-75-191) Avail: NTIS HC A06/MF A01 CSCL 01/3

Three parameter symmetric distributions have been investigated for application as a fatigue life distribution model. Maximum likelihood (ML) estimator, and simulation procedures for maximum variance unbiased estimates and confidence bounds have been developed for analysis of censored data. A technique for testing the hypothesis of two censored samples having a common parent population is also presented. The effect on airplane structural

reliability resulting from differing levels of fatigue performance from nominally identical structures is discussed, and a preflaw model was developed and incorporated in a reliability analysis method. Parametric studies were conducted using the reliability method to obtain qualitative information on the impact and interaction in terms of structural reliabliity, of several variables such as preflaws, loads environment, material, structural configuration, and designed residual strength. Author (GRA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N77-13443 Akron Univ., Ohio.
EFFECT OF LARGE STATIC DEFORMATIONS ON DYNAMIC PROPERTIES Ph.D. Thesis
Ronald Carroll Clark 1976 145 p
Avail: Univ. Microfilms Order No. 76-24981

Two cases are considered, the compression of flexible polyurethane foams and the extension of copolymers. The results which were obtained are expressed as the strain dependence of the dynamic moduli and the tangent of the loss angle. The prediction of these viscoelastic strain relationships was found to be dependent on not only basic chemical differences, variable density in the foams, and changing styrene content in block copolymers, but it is also very much a function of structural design considerations. Testing was done using a non resonant forced vibration technique which could produce known static compressions or extensions prior to dynamic testing.
Dissert. Abstr.

N77-13444 British Library Lending Div., Boston Spa (England).
PLANE BEARING STRUCTURES
Karl Girkmann 21 Jun. 1976 8 p refs
(BLL-Trans-921-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.

Functions used to set up equations for the bending surface of clamped rectangular plates are applied as simple theories for solution of other clamped plates. By using functions with complex arguments, it is possible to avoid double series in the determination of constants for comparison of coefficients in the boundary conditions. Author

N77-13445 Stanford Univ., Calif.
SOLUTION TECHNIQUES FOR LINEAR AND NONLINEAR DYNAMICS OF STRUCTURES MODELED BY FINITE ELEMENTS Ph.D. Thesis
Hojjatollah Adeli-Rankoohi 1976 345 p
Avail: Univ. Microfilms Order No. 76-25965

The accuracy, stability, and efficiency of the solution procedures were examined by comparing the results from a plane stress sample problem. For linear analysis four solution techniques were compared. They are direct linear extrapolation with the trapezoidal rule, the central difference predictor, two cycle iteration with the trapezoidal rule, and the normal mode method. The normal mode method is competitive with the other methods studied only if modal truncation is used. For nonlinear analysis, three explicit methods and three implicit methods were investigated. Both material and geometric nonlinearities were included in the finite element formulation. Elastoplastic behavior was incorporated through a bilinear effective stress-effective strain curve, for which strain hardening of the material is taken into account. Dissert. Abstr.

N77-13446 Stanford Univ., Calif.
A VARIATIONALLY DEVELOPED, CONSISTENT NONLINEAR THEORY FOR THE BUCKLING AND VIBRATION OF THIN RINGS, ARCHES, AND CURVED BEAMS UNDER CONSERVATIVE AND NONCONSERVATIVE LOADING
Michael Joseph Rutkowski 1976 127 p
Avail: Univ. Microfilms Order No. 76-26072

The nonlinear kinematics of the initially curved element are reexamined and a variational principle developed which unifies the nonlinear theory governing the stress and deflection behavior as well as the stability of thin, circularly curved, planar structures under either conservative or nonconservative loading. The variational formulation presented yields the exact set of nonlinear equilibrium equations as well as the boundary condition alternatives for a thin ring, arch, or curved beam and, alternatively, provides a vehicle for straightforward, successive approximation bending, buckling, and postbuckling analyses of these structures in wide practical applications. The variational principle is tested by application to several diverse problems. Dissert. Abstr.

N77-13447 Illinois Univ., Urbana.
SEMI-ANALYTICAL FINITE-ELEMENT ANALYSIS FOR ELASTIC SOLIDS OF REVOLUTION Ph.D. Thesis
Rabindra Kumar Bhattacharyya 1976 135 p
Avail: Univ. Microfilms Order No. 76-24044

The finite-element displacement method is used to determine the response of a linear elastic solid of revolution with a central hole, when subjected to a general symmetric loading. A review of the necessary part of the elasticity theory, a development of isoparametric elements, and the derivations of the necessary equations are presented. Answers to some known problems are supplied for verification of the program developed. A listing of the program source deck, its description and a user's manual are included. Dissert. Abstr.

N77-13448 Pennsylvania Univ., Philadelphia.
STRUCTURAL SYNTHESIS WITH STRESS AND LOCAL INSTABILITY CONSTRAINTS Ph.D. Thesis
Isreb Mustafa 1976 236 p
Avail: Univ. Microfilms Order No. 76-24773

This study presents a finite element program for computer automated synthesis of linear-elastic structures under static loading. The objective of the synthesis is to obtain minimum weight of large structures with constraints on stresses and local instability. The concept of fully-stressed design is used as an optimality criterion. Although a fully-stressed design does not necessarily coincide with the minimum weight design, it is the only practical means of synthesizing large structures in the presence of stress constraints. The proposed optimization algorithm is considerably more flexible in its application than previously published programs. Applications of the method are illustrated by various design problems. Dissert. Abstr.

N77-13449 Delaware Univ., Newark.
TRANSIENT TEMPERATURES, STRESSES, AND DISPLACEMENTS IN A FINITE CIRCULAR CYLINDER DUE TO ASYMMETRIC HEATING Ph.D. Thesis
Ennis Francis Quigley 1976 79 p
Avail: Univ. Microfilms Order No. 76-24266

The analytical expressions for the transient temperature, stress, and displacement fields in an isotropic, homogeneous, solid cylinder of length 2h and radius r sub 0 whose lateral surface is subjected to the asymmetric heating of a nuclear thermal radiation environment. The transient temperature field is obtained by solving the Fourier heat conduction equation using Ojalvo's modified separation-of-variables method. The stress and displacement fields are obtained by solving the Navier displacement equation using Youngdahl's cylindrical stress functions. The use of the Youngdahl stress functions does not result in an exact solution for the stresses but in a plane strain solution for regions away from the ends of the cylinder. Dissert. Abstr.

N77-13450 New Mexico Univ., Albuquerque.
BEHAVIOR OF REINFORCED CONCRETE BEAMS UNDER COMBINED AXIAL AND LATERAL LOADING Ph.D. Thesis
Golden Erwin Lane 1976 150 p
Avail: Univ. Microfilms Order No. 76-25663

Seventeen simply supported reinforced concrete beams were tested under combined flexural, axial, and shear forces to collapse. Each beam had a 12.5-ft span, a 9-by-15-in cross section, and an effective depth of 12.5 in. Reinforcement consisted of three No. 6 bars in tension and two No. 2 bars in compression. Shear reinforcement consisted of No. 2 stirrups on 6-in centers. The beams were loaded laterally through a symmetrical two-point loading system and axially through the plastic centroid. Load was applied by a single hydraulic system designed to provide a

constant ratio between axial and lateral loads for the duration of the tests. The two test parameters were axial-to-lateral-load ratio and shear-span-to-beam-depth ratio. Electrical measurements of beam behavior included steel strain on the longitudinal rebar, concrete strain, vertical deflections along the length of the beam, end rotations, and lateral and axial loads. Dissert. Abstr.

N77-13451 Iowa Univ., Iowa City.
A NONLINEAR FORM OF THE ENDOCHRONIC THEORY AND ITS APPLICATION TO DYNAMIC PLASTICITY Ph.D. Thesis
Albert Ren-Feng Yao 1976 120 p
Avail: Univ. Microfilms Order No. 76-26354

The general nonlinear constitutive equations derived herein have been reduced to specific forms which are suitable to the case of combined tension and torsion of a thin-walled tube. These equations have then been applied to investigate effects which have not so well been predicted by the linear form of the theory. The applications included the mechanical behavior of materials subject to quasistatic and dynamic loads. In both cases, the cross effect between tension (compression) and torsion and the effect due to preloading have been studied. The application of the theory to dynamic plasticity has also been emphasized. This is demonstrated by the consideration of two well-known problems in the field of plastic wave propagation related to the longitudinal plastic waves. Dissert. Abstr.

N77-13452 Utah State Univ., Logan.
VIBRATION ANALYSIS OF LINEARLY TAPERED BEAMS USING FREQUENCY-DEPENDENT STIFFNESS MASS MATRICES Ph.D. Thesis
Arvind Kumar Gupta 1975 153 p
Avail: Univ. Microfilms Order No. 76-25608

The influence of dynamic correction stiffness and inertia matrices on the vibration of linearly tapered beams is investigated using matrices derived by the finite element method. Numerical results are obtained and compared with the available analytical solutions and the approximate solutions based upon stepped representation of the beams using uniform elements. The significance of the severity of taper within beams upon solution accuracy and convergence characteristics is examined. A discussion of the comparative costs and advantages and disadvantages of the quadratic and conventional matrix formulation is also given. The convergence of the frequencies to their exact values, at the same level of grid refinement, is much faster when quadratic matrix formulation is used instead of the conventional formulation, especially in the range of coarse idealizations and higher modes. Dissert. Abstr.

N77-13453 Arkansas Univ., Fayetteville.
FINITE ELEMENT, SIMILITUDE AND SOIL STRUCTURE INTERACTION STUDY OF BURIED CYLINDERS UNDER DYNAMIC LOADING Ph.D. Thesis
Carl Eugene Pace 1976 313 p
Avail: Univ. Microfilms Order No. 76-26388

A dynamic shock wave test of 550 psi maximum pressure was performed on a prototype and a 1/4-scale model, both of axisymmetric reinforced concrete construction. The prototype and model were representative of missile launch structures and were buried with their tops flush with the top of a sand environment. The shock wave was produced by detonating primacord in firing tubes located directly over the test environment. Baffles caused the gases to direct a plane shock wave onto the soil-structure surface. The objectives of the test were to: (1) verify similitude theory of response between prototype and model; (2) make computations of prototype and free field response by using a finite element computer program and compare the finite element calculations with experimental data; and (3) determine the interaction forces on the model and prototype. It was concluded that prototype results can be predicted from model test by similitude theory for similar scales and test situations by plus or minus 25%. Dissert. Abstr.

N77-13454 Virginia Polytechnic Inst. and State Univ., Blacksburg.
MOVING LOADS ON ELASTICALLY-SUPPORTED BEAMS Ph.D. Thesis
Tamer A. Apaydin 1976 100 p
Avail: Univ. Microfilms Order No. 76-24311

The dynamic responses of the simply, elastically, and system of elastically-supported beams on an elastic foundation subjected to moving concentrated loads were obtained by means of the harmonic analysis method. The response of a simply supported beam of a finite length on an elastic foundation carrying moving concentrated loads was scrutinized and used to obtain closed-form approximate solutions for elastically- and system of elastically-supported beams. For the cases of elastically- and system of elastically-supported beams, the effects of the upward end displacements on the dynamic response of the beams were investigated and verified by observing railroad tracks which showed a noticeable amount of wear at the joints, subsequent erosion of the roadbed and loosening of the spikes near the joints in a greater amount than those in other parts of the rails.
Dissert. Abstr.

N77-13455 Arkansas Univ., Fayetteville.
FREE VIBRATION AND STEADY-STATE RESPONSE OF A NONLINEAR OSCILLATOR WITH HYSTERESIS Ph.D. Thesis
Kirk Ewell Boatright 1976 102 p
Avail: Univ. Microfilms Order No. 76-26456

A nonlinear hysteretic model as a mechanism for the restoring force and energy dissipation in an oscillator is proposed and investigated. The proposed model is referred to as a binonlinear hysteretic model of the cubic type. Characteristics of the response of the model under free vibrations and steady state forced vibrations are determined and presented analytically and graphically. Results of the study reveal the existence of interesting features including the rapid decay of energy dissipation in free vibrations and the various jump phenomena for certain combinations of system parameters in steady state forced vibrations.
Dissert. Abstr.

N77-13456# Royal Netherlands Aircraft Factories Fokker, Amsterdam.
FATIGUE TESTS ON TWO SIDES CLAD-, ONE SIDE MACHINED AND ONE SIDE CHEMMILLED 2024-T3- AND 7075-T6 CLAD SHEET (AVB 1435)
H. VanderLaan 12 Dec. 1975 35 p refs
(SP-80) Avail: NTIS HC A03/MF A01

Comparative fatigue tests are made of machine tapered and chemill tapered anodized clad sheet. No significant difference is found between the two methods, neither in fatigue strength, nor in crack propagation. Static tensile tests in longitudinal direction and surface roughness measurements are included.
Author

N77-13457*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HEAVY SECTION FRACTURE TOUGHNESS SCREENING SPECIMEN
John L. Shannon, Jr., J. Keith Donald (Ocean City Res. Corp., Hellertown, Pa.), and William F. Brown, Jr. May 1976 24 p refs Presented at the Symp. on Develop. in Fracture Mech. Test Method Standardization, St. Louis, 2-7 May 1976; sponsored by Am. Soc. Test Mater.
(NASA-TM-X-73561) Avail: NTIS HC A02/MF A01 CSCL 11F

Size requirements for a pin loaded double edge notch + crack tension specimen proposed for fracture toughness screening heavy section alloys were studied. Ranking of eight selected alloys based on the specimen's net strength was compared with that based on the valid plane strain fracture toughness separately determined. Performance of the specimen was judged on the basis of that comparison. The specimen's net strength was influenced by three critical specimen dimensions: distance between the crack plane and the loading hole, specimen width, and specimen thickness. Interaction between the stress fields of the crack and the loading holes reduced the net strength, but this effect disappeared as the separation reached a dimension equal to the specimen width. The effects of specimen width and thickness are interrelated and affect the net strength through their influence on the development of the crack tip plastic zone.
Author

N77-13458# Georgia Inst. of Tech., Atlanta. School of Engineering Science and Mechanics.

MINIMUM WEIGHT DESIGN OF STIFFENED CYLINDERS AND CYLINDRICAL PANELS UNDER COMBINED LOADS
Interim Report, 1 Feb. 1975 - 31 Jan. 1976
George J. Simitses, Jagannath Giri, and Izhak Sheinman 30 Sep. 1976 231 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Aircraft in May 1977
(Grant AF-AFOSR-2655-74)
Avail: NTIS HC A11/MF A01

A methodology is presented for the minimum weight design of stiffened cylinders under combined loads of torsion, uniform axial compression and pressure. A number of illustrative examples are included in order to demonstrate the methodology. In addition, the listing of the developed computer program is included. A methodology is presented for the minimum weight design of stiffened curved plates under combined shear with uniaxial or biaxial compression. This methodology is illustrated through a number of examples. A complete listing of the developed computer programs is included along with the associated flow charts for data preparation. The load cases considered are representative of the worst possible load cases of destablizing loads that an aircraft fuselage is expected to encounter. The methods developed represent a fully automated design procedure for that portion of the fuselage which is designed primarily against general instability. Author

N77-13459# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
A SIMPLE THEORY OF GEOMETRICAL STIFFNESS WITH APPLICATIONS TO BEAM AND SHELL PROBLEMS
J. H. Argyris and P. C. Dunne Dec. 1975 114 p refs Presented at the 2d Intern. Symp. on Computing Methods in Appl. Sci. and Eng., Versailles, France, 15-19 Dec. 1975
(ISD-183) Avail: NTIS HC A06/MF A01

Geometrical stiffness is the basis for any attempt to study the behavior of slender beams and thin shells under conditions in which large deflections may occur with small strains. Although beams are considered among the simplest of structural elements their analysis when bent and twisted in three dimensions is by no means simple, and the same is true of the consideration of their geometrical stiffness in space. Thus the beam in space may be considered as a test case for the general methods developed here. The large deflection theory of plate and shells is generally concerned with deflections of the order of the thickness which are sufficient to induce considerable membrane stresses. Thus the nonlinear effect arises from the induced membrane stresses rather than from gross changes in geometry. The problem of snap through and the problem of the three-dimensional elastica pose some very difficult finite element applications in which the geometry changes are of the order of the structural dimensions. To tackle such problems using a highly sophisticated shell element such as SHEBA is not an easy undertaking. For other more immediately practical reasons it has been necessary to develop a simple flat facet shell element with transverse shear deformation also. This element, which is a displacement but not a Rayleigh-Ritz element, has only 18 nodal freedoms and is adaptable to thin, thick, and sandwich type applications; it is especially suitable for large deflection problems. Some large deflection examples for beams are presented. Author (ESA)

N77-13460# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
ON THE APPLICATION OF THE NATURAL MODE TECHNIQUE TO SMALL STRAIN LARGE DISPLACEMENT PROBLEMS
J. H. Argyris and P. C. Dunne Oct. 1975 133 p refs Presented at the World Congr. on Finite Elem. Methods in Struct. Mech., Bournemouth, Engl., 12-17 Oct. 1975
(ISD-184) Avail: NTIS HC A07/MF A01

The natural mode technique requires the preparation of the natural (tangent) elastic and geometrical stiffness of the element as well as of the geometrical or initial load stiffness associated with each natural force due to changes in the rigid body orientation and shape of element. Generally the small strain condition makes the shape change effect on the geometrical stiffness negligible. When the natural modes and forces include rotations and moments in more than one plane (as in beams in space), the geometrical stiffness associated with certain natural forces may become nonsymmetrical. A simple displacement element derived from three plane membrane elements for plates and shells in which shear deformation is important and which is both capable of engineering accuracy and adaptable to all types of material and geometric variations is described. ESA

N77-13461# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
SIGNIFICANCE OF THE IRREGULARITY OF GAUSSIAN RANDOM SEQUENCES ON FATIGUE LIFE
E. Gassner, H. Lowak, and D. Schuetz 20 Jan. 1976 67 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(LBF-FB-124/76) Avail: NTIS HC A04/MF A01; Lab. fuer Betriebsfestigkeit, Darmstadt, West Ger. DM 38

Notched specimen and single shear lap joints of aluminum alloy 2024 were tested under axial random loading sequences to determine the influence of irregularity on fatigue life. The irregularity factors (1=0.99, 0.7, 0.3) cover the range interesting in practice. The method of generating random sequences ensures that the factor of irregularity is the only variable of the random sequence. For the notched specimens as well as for joints it is shown that fatigue lives defined by zero crossings grow with increasing irregularity, depending upon stress ratio for the notched specimens and upon stress ratio and stress level for joints.
Author (ESA)

N77-13462# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
THE AMPLITUDE TRANSFORMATION PROCEDURE
E. Haibach and H. P. Lehrke 19 Dec. 1975 98 p refs In GERMAN; ENGLISH summary Sponsored by VDEh-Ges. zur foerder. der Eisenforsch.
(LBF-FB-125/75) Avail: NTIS HC A05/MF A01; Lab. fuer Betriebsfestigkeit, Darmstadt, West Ger. DM 55

The procedure discussed is based on the hypothesis of linear damage accumulation and is aimed at improving the fatigue life calculation of structural components. A new concept enables changes of the local mean stress and interactions resulting from a complex loading sequence to be considered more effectively than by current methods. The basic idea is to decrease (or increase) the nominal stress amplitude of each cycle analyzed in such a way that favorable (or detrimental) effects of mean stress and of interactions will be covered. In a computer program the degree of amplitude transformation is derived from the hysteresis loop of the local stress and strain at the fatigue critical point of stress concentration by means of a properly defined damage parameter. Author (ESA)

N77-13463# Technische Hogeschool, Delft (Netherlands). Stevin Lab.
INVESTIGATION ON THE STATIC BEHAVIOUR OF WELDED LATTICE GIRDER JOINTS IN STRUCTURAL HOLLOW SECTIONS Interim Report
A. A. vanDouwen and J. Wardenier [1975] 38 p refs Presented at the IIW Ann. Assembly, Tel Aviv, Israel Prepared jointly with Inst. TNO voor Bouwmaterialen en Bouwconstruct.
(IR-6-75-11; BI-IR-75-37) Avail: NTIS HC A03/MF A01

An extensive research project is being carried out on static loaded welded lattice girder joints of different configurations and hollow sections. Parameters influencing the static strength of these joints are being studied. Most specimens tested were RR joints with a gap between the bracings. Except for one test series, all test specimens were welded with rutile electrodes. Based on 22 tests on T joints with rectangular hollow section preliminary conclusions are given based on ultimate strength criteria. ESA

N77-13464# Instituut TNO voor Bouwmaycrialen en Bouwconstructies, Delft (Netherlands).
THE WIND LOAD ON CHIMNEYS IN SOME COUNTRIES
H. vanKoten Apr. 1975 31 p refs
(BI-75-32) Avail: NTIS HC A03/MF A01

For optimal structural design the wind load on chimneys in Belgium, Great Britain, France, Italy, Netherlands, the U.S., and Western Germany is discussed. For the calculation of the chimney dimensions, the bending moment at ground level was calculated taking into account a safety factor, gamma. Another comparable method is dividing the ultimate stresses of the construction

material by gamma and comparing these stresses with the stresses caused by the bending moment. Calculation methods of the countries are compared by determining the bending moments of a chimney with 100 m height, 8 m diameter, and 0.5 Hz resonant frequency. Large differences between the design values for the bending moments in chimneys were found. The results are compared to a statistical calculation method with an economy based condition. ESA

N77-13465# Instituut TNO voor Bouwmaycrialen en Bouwconstructies, Delft (Netherlands).
WIND TUNNEL INVESTIGATION [WINDTUNNELONDERZOEK]
W. J. Beranek Nov. 1975 17 p In DUTCH
(BI-75-77) Avail: NTIS HC A02/MF A01

A study to arrive at wind hindrance regulations was made. Aerial photographs of tall building city quarters in the Netherlands were taken. Using these photographs the type of buildings with which the wind hindrance investigation could start was selected. How results can be represented graphically is indicated. ESA

N77-13466# Instituut TNO voor Bouwmaycrialen en Bouwconstructies, Delft (Netherlands).
CRACK-WIDTH CALCULATIONS FOR CONCRETE OFFSHORE STRUCTURES
T. Monnier 18 Dec. 1975 8 p
(BI-75-95) Avail: NTIS HC A02/MF A01

A modified version of the CEB-FIP formula calculating the crack width in concrete offshore structural members (cover and bars) loaded mainly in tension is presented. The correction is based on experimental investigations. ESA

N77-13467# Southampton Univ. (England). Inst. of Sound and Vibration Research.
A MULTILAYER BEAM THEORY INCORPORATING TRANSVERSE SHEAR, ROTARY AND LONGITUDINAL INERTIA EFFECTS
R. J. Kershaw [1975] 95 p refs Sponsored by Min. of Defence
(ISVR-TR-72) Avail: NTIS HC A05/MF A01

A theory of laminated beams was derived which includes the effects of transverse shear deformation and rotary and longitudinal inertia for an arbitrary number of layers. By assuming zero transverse direct strain it was possible to express the longitudinal displacements in terms of three variables. Equations of motion and boundary conditions were derived by a variational method, using a compact vector/matrix notation. The governing equations for damped normal modes of the system were derived and used to solve the general forced vibration problem. When rotary and longitudinal inertia effects are neglected, the general case reduces to one of sixth order; a parameter study of a free-free beam is presented for this case. Finally, some applications of the theory are discussed and a numerical comparison of various theories of three-layered beams is made. Author (ESA)

N77-13468# Bristol Univ. (England). Dept. of Aeronautical Engineering.
METHOD FOR DETERMINATION OF AERODYNAMIC CHARACTERISTICS OF A SUSPENSION BRIDGE USING A SECTIONAL MODEL B.S. Thesis
W. Chea Jun. 1976 50 p refs
(BU-202) Avail: NTIS HC A03/MF A01

An experimental technique to predict oscillations and prevent damage of suspension bridges in high winds is described, through which oscillatory derivatives can be deduced from data collected in the constant-amplitude sinusoidal forcing of a simple sectional model of a bridge deck structure. Both vertical translation and torsional freedoms were allowed. The apparatus for such tests was built and shown to operate as desired, but the tests were not sufficiently complete to prove that the method is entirely adequate. Author (ESA)

N77-13469# Ernst-Mach-Inst., Freiburg (West Germany).
DYNAMIC REACTIONS OF FRAME BUILDINGS DURING BLOWOUT OF SURFACE PANELS BY SHOCK LOADING. LOADING OF FRAME BUILDINGS BY SHOCK WAVES
Wolfgang Koerner Jun. 1976 49 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Wohnungswesen u. Staedtebau
(Rept-2/76) Avail: NTIS HC A03/MF A01

Two computer programs are presented for closed rectangular buildings and open frame buildings to determine the loading of these buildings caused by the shock wave of a nuclear explosion. The input values are the distance to the explosion center, the explosion yield, and the dimensions of the building. The programs produce mean values of the pressure as function of time at characteristic surfaces of the building. The punched cards are input cards for the NONSAP program, a computing program for static and dynamic response of nonlinear systems. Author (ESA)

N77-13470# Ernst-Mach-Inst., Freiburg (West Germany).
DIFFRACTION OF A DILATATIONAL PULSE IN AN ELASTIC MEDIUM AT A REINFORCED CYLINDRICAL CAVITY
P. W. Buecking 1976 121 p refs In GERMAN; ENGLISH summary
(Rept-3/76) Avail: NTIS HC A06/MF A01

The problem of reflection and refraction of a plane pulse at an infinitely long reinforced cylindrical cavity was studied. The pulse's direction of incidence is perpendicular to the cylinder's axis; its time history is given as an exponential time function. The reinforcement is caused by a layer of finite thickness concentrically surrounding the cavity, in which Young's modulus and density continuously and weakly grow towards the cavity boundary. The linearized equations were solved for distinct frequencies of the pulse spectrum by use of Fourier series. These solutions were numerically integrated by Gaussian quadrature. It was then possible to compute the time history of displacements, circumferential stress, etc., at the cavity boundary during the transit of the pulse. The influence of the reinforcement was found for different pulse widths but unchanged amplitude by comparison with the nonreinforced cavity. Author (ESA)

N77-13471# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
PREDICTION OF FATIGUE CRACK PROPAGATION IN AIRCRAFT MATERIALS UNDER VARIABLE-AMPLITUDE LOADING
J. Schijve Mar. 1975 27 p refs Presented at the ASTM Symp. on Fatigue Crack Growth under Spectrum Loads, Montreal, 23-24 Jun. 1975
(VTH-193) Avail: NTIS HC A03/MF A01

A discussion on loads in service is given followed by a survey of various types of variable-amplitude loading as applied in test programs. The various phenomenological aspects of fatigue damage associated with fatigue cracks are indicated. Interaction effects between cycles of different magnitudes are defined. Methods for measuring interaction effects, examples of interaction effects, and possible explanations are reviewed. Both tests with simple types of variable-amplitude loading (overloads and step loading) and more complex load-time histories (program loading, random load and flight-simulation loading) are included. New evidence on crack closure is presented. Various types of prediction methods are discussed. Author (ESA)

N77-13472# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
MEASUREMENT OF THE CRACK LENGTH IN A METAL SHEET WITH AN ELECTRIC POTENTIAL METHOD [METING VAN DE SCHEURLENGTE IN EEN METAALPLAAT M.B.V. EEN ELEKTRISCHE POTENTIAAL METHODE]
A. Burgers, H. L. Ewalds, G. F. J. A. VanGestel, and L. B. Vogelesang Feb. 1975 30 p refs In DUTCH; ENGLISH summary
(VTH-194) Avail: NTIS HC A03/MF A01

The change in length of an edge or central crack in a metal sheet can be assessed by measuring the change in electrical potential of the sheet containing the crack. A description is given, and the results of the applied method are discussed. The method has been used to measure crack propagation rates during fatigue tests. The experimental procedure is described. Author (ESA)

N77-13473# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
SOME ASPECTS OF THE ENVIRONMENTAL EFFECT ON

THE FATIGUE MECHANISM OF A HIGH STRENGTH ALUMINIUM ALLOY

L. B. Vogelesang Jun. 1975 30 p refs
(VTH-200) Avail: NTIS HC A03/MF A01

Theoretical studies on crack growth usually consider only the behavior of the material (plasticity) and the state of stress. It is shown that the environment essentially changes the mechanism of crack growth. Crack propagation tests were conducted using aluminum 7075-T6 sheet to study the relationship between the crack propagation rate and the stress intensity range in different environments. The crack propagation results are complemented by fractographic analysis. A model based on ideas as postulated by Tomkins, Laird, and Kelly is preferred. The significance for crack growth under corrosion fatigue conditions is discussed. Author (ESA)

N77-13474# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

STRESSES AROUND A LOADED PIN OR RING IN AN ELASTIC ORTHOTROPIC OR ISOTROPIC PLATE [SPANNINGEN RONDEEN BELASTE PEN OF RING IN EEN ELASTISCHE ORTHOTROPE OF ISOTROPE PLAAT]

G. J. Spies Jan. 1976 36 p refs In DUTCH
(VTH-208) Avail: NTIS HC A03/MF A01

In order to determine stresses resulting from a pin-hole joint in isotropic or orthotropic material (carbon fiber reinforced plastics), the stresses are calculated resulting from an infinitely stiff inclusion glued to an infinitely large plate, loaded by a force, and those resulting from an unloaded oversized pin. The stresses around a loaded oversized pin in isotropic and orthotropic material are then calculated by superposition. ESA

N77-13475# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

CANTILEVER BEAM TESTS ON REINFORCED ICE

Eric G. Ohstrom and Stephen L. DenHartog Apr. 1976 21 p refs
(DA Proj. 4A0-62112-A-894)
(AD-A025380; CRREL-76-7) Avail: NTIS HC A02/MF A01 CSCL 08/12

This report covers a series of cantilever beam tests designed to determine the efficacy of adding reinforcement to an ice cover. Tests were run using 1-in.-diam tree branches, 3/16-in.-diam wire rope and 9/16-in. half-round wood dowels as reinforcement for both seawater and freshwater ice. The results show a definite advantage derived from using reinforcement, even when poorly placed. The results also show that reinforced ice carries a load even after it cracks. Thus, after the initial cracks there is time to remove people and equipment before final breakthrough. One must bear in mind, however, that reinforcement has disadvantages. The darker reinforcement absorbs solar radiation and thereby causes earlier weakening of the ice cover. Also, in many cases the time and effort required to place reinforcement may exceed those required to achieve equal strength by additional thickening of the ice sheet. This study has shown that understanding of the failure mechanism of ice under repetitive loading is poor and that future studies should be performed on this problem. Also, this study covered only cantilever beams. The actual field problem is strengthening a three-dimensional sheet. Hence, distribution and orientation of the reinforcement should be addressed in future studies. GRA

N77-13476# State Univ. of New York, Buffalo. Faculty of Engineering and Applied Sciences.

DYNAMICS OF INITIALLY STRESSED HYPERELASTIC SOLIDS Interim Report

Herbert Reismann and Peter S. Pawlik Apr. 1976 69 p refs
(Contract AF-AFOSR-2943-76; AF Proj. 6813; AF Proj. 9782)
(AD-A025127; AFOSR-76-0592TR; Rept-99) Avail: NTIS HC A04/MF A01 CSCL 20/11

This report presents a linear, three-dimensional theory for the incremental motion of initially stressed, hyperelastic solids. The magnitude of the initial deformation and the form of the strain energy density function are both arbitrary except for the usual restrictions placed on them by the principles of mechanics and thermodynamics. A variational approach, using Hamilton's Principle, is used to derive the equations of motion and the proper natural boundary conditions for the incremental motion. This approach yields a variational principle which, because of its scalar form, can be used to derive the appropriate equations in any particular coordinate system. This variational principle also provides a framework for the systematic development of special, approximate theories, for the incremental motion of rods, beams, plates, shells, etc. In addition to the general theory, the report presents a resolution of the forced, incremental motion problem of hyperelastic solids of bounded extent. The investigation concludes with two applications: (a) the solid subjected to initial hydrostatic pressure, and (b) the theory of the initially stressed beam. GRA

N77-13477# National Materials Advisory Board, Washington, D.C.

APPLICATION OF FRACTURE MECHANICS ANALYSIS TECHNIQUES IN HIGH PERFORMANCE MARINE SYSTEMS Final Report

1976 28 p refs
(Contract MDA903-74-C-0167)
(AD-A025148; NMAB-327) Avail: NTIS HC A03/MF A01 CSCL 13/10

High-performance naval surface ships of the future probably will employ materials with intermediate to high strength-to-weight ratios. Because some of these materials are susceptible to rapid fracture resulting from small flaws, sub-critical crack growth aspects of material behavior, such as stress-corrosion cracking and fatigue, should be reviewed as a part of the design process, preferably as part of an overall fracture control plan. Experience suggests that the development and implemenation of such a plan as part of the design process will result in a more balanced design from the standpoint of safety, reliability, and economics. Author (GRA)

N77-13478# Brown Univ., Providence, R. I. Dept. of Engineering.

MODE APPROXIMATION TECHNIQUE APPLIED TO FINITE DEFLECTIONS OF AN IMPULSIVELY LOADED VISCOPLASTIC PLATE

C. T. Chon and P. S. Symonds Nov. 1975 45 p refs
(Contracts N00014-75-C-0860; NSF ENG-74-21258)
(AD-A024862; TR-1) Avail: NTIS HC A03/MF A01 CSCL 13/13

The extension of the 'mode approximation' technique to finite deflections is illustrated in this paper by application to a fully clamped plate which is impulsively loaded and whose material exhibits rigid-perfectly plastic or viscoplastic behavior. Deflections up to about ten plate thicknesses are treated. The approximation technique requires finding 'instantaneous mode' form solutions at a sequence of times, satisfying the current equations of material behavior, edge constraint, and dynamics including finite deflections terms. The modal form is defined as having velocity and acceleration fields differing by a scalar factor. Thus ordinary rather than partial differential equations are solved. Iterative methods are described which furnish these solutions efficiently in the present problem. The general approach furnishes some useful information about errors of the final deflection magnitudes. Comparisons are made with other solutions and experimental results. GRA

N77-13479# Georgia Inst. of Tech., Atlanta. School of Engineering Science and Mechanics.

MINIMUM WEIGHT DESIGN OF STIFFENED CYLINDERS AND CYLINDRICAL PANELS UNDER COMBINED LOADS Interim Report, 1 Feb. 1975 - 31 Jan. 1976

George J. Simitses, Jagannath Giri, and Izhak Sheinman Mar. 1976 233 p refs
(Grant AF-AFOSR-2655-74; AF Proj. 9782)
(AD-A027720; AFOSR-76-0930TR) Avail: NTIS HC A11/MF A01 CSCL 01/3

This report is divided into two parts, Parts A and B. In Part A, a methodology is presented for the minimum weight design of stiffened cylinders under combined loads of torsion, uniform axial compression and pressure. A number of illustrative examples are included in order to demonstrate the methodology. In addition, the listing of the developed computer program is included and thus those interested in the program can easily use it. In Part B, a methodology is presented for the minimum weight design of stiffened curved plates under combined shear

with uniaxial or biaxial compression. This methodology is illustrated through a number of examples. At the end of this second part a complete listing of the developed computer programs is included along with the associated flow charts for data preparation. The load cases considered in both parts are representative of the worst possible load cases of destabilizing loads that an aircraft fuselage is expected to encounter. The methods developed represent a fully automated design procedure for that portion of the fuselage which is designed primarily against general instability. GRA

N77-13480# Terra Tek, Inc., Salt Lake City, Utah.
EXPERIMENTAL AND ANALYTICAL STUDY OF THE RESPONSE OF EARTH MATERIALS TO STATIC AND DYNAMIC LOADS Final Report
H. P. Pratt, J. N. Johnson, H. S. Swolfs, A. D. Black, and C. Brechtel Kirtland AFB., N. Mex. AFWL May 1976 90 p refs
(Contract F29601-74-C-0118)
(AD-A027094; TR-75-48; AFWL-TR-75-278) Avail: NTIS HC A05/MF A01 CSCL 08/7

A field and laboratory experimental test program was conducted at the Mixed Company and Cedar City test sites to determine the effect of specimen size on the strength and deformation of intact and jointed rock. The strength of Cedar City quartz diorite decreased by a factor of four with increasing specimen size; the Kayenta sandstone decreased by a factor of less than two. A large block test was conducted at the Mixed Company site in which deformation and velocity was measured as a function of stress. The in-situ stress conditions were measured at the Mixed Company site and had a marked effect on the seismic wave velocity in the sandstone. In addition, in situ modulus was measured by several different techniques. A constitutive model for jointed rock, incorporating real data, was developed for use in the calculation of rock mass response. The model for the compressive properties consists of a rate dependent model of the Maxwell type while the plastic shear response due to the presence of joints, is accounted for in terms of additional plastic deformation associated with slip on the joint planes. GRA

N77-13481# Terra Tek, Inc., Salt Lake City, Utah.
MEASUREMENT OF LOW-PRESSURE STATIC ELASTIC MODULI OF ROCK AND COMPARISON WITH ULTRASONIC DATA Final Report, Apr. 1974 - Aug. 1975
L. M. Barker, R. Lingle, R. R. Hendrickson, and J. N. Johnson Oct. 1975 30 p refs
(Contract DNA001-75-C-0102; DNA Proj. NWED-OAXSB047)
(AD-A027032; TR-75-30; DNA-3886F) Avail: NTIS HC A03/MF A01 CSCL 09/7

Experimental methods are presented for accurate laboratory measurement of static elastic moduli of rocks at very low stress. Axial strain is measured with a resolution of 0.000002 with a carefully designed cantilever system, and the transverse strain is measured with a resolution of 0.0000001 by means of a laser interferometer technique. Static moduli are then measured under conditions of uniaxial stress and compared with ultrasonically determined moduli for the same sample. It is found that the static and ultrasonic moduli do not agree even at peak stress levels less than 1 bar. GRA

N77-13482# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
A STUDY OF THE HIGHER MODAL DYNAMIC PLASTIC RESPONSE OF BEAMS
Norman Jones and T. Wierzbicki Apr. 1976 40 p
(Contract N00014-76-C-0195; MIT Proj. DSR-83344; NR Proj. 064-510)
(AD-A025204; Rept-76-3) Avail: NTIS HC A03/MF A01 CSCL 20/11

A theoretical and experimental investigation into the higher modal dynamic plastic response of fully clamped beams is reported herein. It is shown that the influence of geometry changes or finite-deflections is important. It appears that the higher modal response of beams is a more efficient means of absorbing a given magnitude of kinetic energy than a single modal response. GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N77-13483 California Univ., Los Angeles.
APPLICATION OF REMOTE SENSING TO MANAGING THE EARTH'S ENVIRONMENT Ph.D. Thesis
Robert Bruce Gerding 1976 335 p
Avail: Univ. Microfilms Order No. 76-25197

A review of the state of the art of earth observation remote sensing is presented, and the design and development process employed to create a remote sensing space program is described. The history of earth observation remote sensing is discussed with particular emphasis being placed on the last six years. The design and development process is discussed for each of the following major areas within a remote sensing space program: (1) user information needs; (2) remote sensing measurement requirements; (3) remote sensing devices (i.e., sensors); (4) orbit selection; (5) data acquisition platform; and (6) data management system. In discussing data acquisition platforms, consideration is given to both free flying, unmanned spacecraft and spacelab payloads. Dissert. Abstr.

N77-13484 Illinois Univ., Urbana-Champaign.
ISOTOPIC CHARACTERIZATION OF ILLINOIS NATURAL GAS Ph.D. Thesis
Dennis Dale Coleman 1976 185 p
Avail: Univ. Microfilms Order No. 76-24060

To characterize natural gas from various sources in Illinois, over 100 samples were collected and analyzed. Of these, 19 samples from gas wells in Paleozoic bedrock were studied. This gas appears to have been formed by thermal decomposition of organic material. In addition, 22 samples from gas wells in glacial drift were analyzed. The origin of this gas from bacterial decomposition of organic material within the glacial drift was confirmed by radiocarbon dating of methane. Evidence suggests that the primary mode of methane migration in glacial drift is in solution with ground water. Analyses of 52 samples of gas from freshwater wells indicate that all but two of these samples are of bacterial origin. Several samples of methane from artificial sources including water wells and sanitary landfills, were also analyzed. Finally, a model of kinetic isotope effects during bacterial production of methane was developed and compared to both experimental and natural systems. Dissert. Abstr.

N77-13485 Ohio State Univ., Columbus.
CONSIDERATIONS FOR AUTOMATED DIGITAL TERRAIN MODELS WITH APPLICATIONS IN DIFFERENTIAL PHOTO MAPPING Ph.D. Thesis
Olubodun Olarewaju Ayeni 1976 208 p
Avail: Univ. Microfilms Order No. 76-24552

A comprehensive definition which accords proper recognition to the problem areas of digital terrain models was given. Various quantitative methods for describing a terrain were investigated. Based on these terrain characteristics, four major classes of terrains which span the whole spectrum of terrain types were identified. The relative efficiency of seven different sample patterns was investigated in relation to four major classes of terrain. Optimum sample size for any class of terrain was determined through the process of progressive sampling. Various interpolation techniques, were classified into four groups according to their accuracy capabilities, after their reactions were evaluated in relationship to four major classes of terrain. A computer program was written to automate some aspects of digital terrain models operations.

Application of an automated digital terrain model was exemplified by a differential photo mapping problem. Dissert. Abstr.

N77-13486*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
APOLLO-SOYUZ DOPPLER-TRACKING EXPERIMENT MA-089 Final Report
G. C. Weiffenbach, M. D. Grossi, and P. W. Shores Oct. 1976 153 p refs
(Contract NAS9-13837)
(NASA-CR-151122) Avail: NTIS HC A08/MF A01 CSCL 08B

The Doppler tracking experiment was designed to test the feasibility of improved mapping of the earth's gravity field by the low-low satellite-to-satellite tracking method and to observe variations in the electron density of the ionosphere between the two spacecraft. Data were taken between 1:01 and 14:37 GMT on July 24, 1975. Baseline data taken earlier, while the docking module was still attached to the command and service module, indicated that the equipment operated satisfactorily. The ionospheric data contained in the difference between the Doppler signals at the two frequencies are of excellent quality, resulting in valuable satellite-to-satellite observations, never made before, of wave phenomena in the ionosphere. The gravity data were corrupted by an unexpectedly high noise level of as-yet-undetermined origin, with periods greater than 150 seconds, that prevented unambiguous identification of gravity-anomaly signatures. Author

N77-13487*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT US STANDARD CATALOG, 1-30 SEPTEMBER 1976
30 Sep. 1976 109 p
(NASA-TM-X-74302; GSFC/LU-76/009; NTISUB/B/138-76/009) Avail: NTIS HC A06/MF A01 CSCL 05B

Imagery acquired by LANDSAT 1 and LANDSAT 2 which has been processed and input to the data files during the referenced month are listed. Data, such as data acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N77-13488*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT US STANDARD CATALOG, 1-31 OCTOBER 1976
31 Oct. 1976 102 p
(NASA-Tm-X-74303; GSFC/LU-76/010) Avail: NTIS HC A06/MF A01 CSCL 05B

Imagery acquired by LANDSAT 1 and LANDSAT 2 which has been processed and input to the data files during the referenced month are listed. Data, such as date acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N77-13489*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT NON-US STANDARD CATALOG Monthly Report, 1-30 Sep. 1976
30 Sep. 1976 122 p
(NASA-TM-X-74304; GSFC/LN-76/009; NTISUB/B/139-76/009) Avail: NTIS HC A06/MF A01 CSCL 05B

The Non-U.S. Standard Catalog lists imagery acquired by LANDSAT 1 and LANDSAT 2 which has been processed and input to the data files during the referenced month. Data, such as data acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N77-13490*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT NON-US STANDARD CATALOG Monthly Report, 1-31 Oct. 1976
31 Oct. 1976 84 p
(NASA-TM-X-74305; GSFC/LN-76/010; NTISUB/B/139-76/010) Avail: NTIS HC A05/MF A01 CSCL 05B

For abstract, see N77-13489.

N77-13491*# Lockheed Electronics Co., Houston, Tex. Dept. of Life Sciences Applications.
REMOTE SENSING FOR CONTROL OF TSETSE FLIES
L. E. Giddings Sep. 1976 38 p refs
(Contract NAS9-12200)
(NASA-CR-151136; LEC-9155; JSC-11652) Avail: NTIS HC A03/MF A01 CSCL 06F

Remotely sensed information is discussed which has potential for aiding in the control or eradication of tsetse flies. Data are available from earth resources meteorological, and manned satellites, from airborne sensors, and possibly from data collection platforms. A new zone discrimination technique, based on data from meteorological satellites may also allow the identification of zones hospitable to one or another species of tsetse. For background, a review is presented of the vegetation of Tanzania and Zanzibar, and illustrations presented of automatic processing of data from these areas. In addition, a review is presented of the applicability of temperature data to tsetse areas. Author

N77-13492*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ADDITIONAL STUDIES OF FOREST CLASSIFICATION ACCURACY AS INFLUENCED BY MULTISPECTRAL SCANNER SPATIAL RESOLUTION
Franklin E. Sadowski and Jane E. Sarno Aug. 1976 56 p ref
(Contract NAS9-14988)
(NASA-CR-151138; ERIM-122700-4-R) Avail: NTIS HC A04/MF A01 CSCL 02F

First, an analysis of forest feature signatures was used to help explain the large variation in classification accuracy that can occur among individual forest features for any one case of spatial resolution and the inconsistent changes in classification accuracy that were demonstrated among features as spatial resolution was degraded. Second, the classification rejection threshold was varied in an effort to reduce the large proportion of unclassified resolution elements that previously appeared in the processing of coarse resolution data when a constant rejection threshold was used for all cases of spatial resolution. For the signature analysis, two-channel ellipse plots showing the feature signature distributions for several cases of spatial resolution indicated that the capability of signatures to correctly identify their respective features is dependent on the amount of statistical overlap among signatures. Reductions in signature variance that occur in data of degraded spatial resolution may not necessarily decrease the amount of statistical overlap among signatures having large variance and small mean separations. Features classified by such signatures may thus continue to have similar amounts of misclassified elements in coarser resolution data, and thus, not necessarily improve in classification accuracy. Dissert. Abstr.

N77-13493*# General Electric Co., Philadelphia, Pa. Space Div.
LANDSAT D USER DATA PROCESSING STUDY Final Report
22 Nov. 1976 57 p
(Contract NAS5-23412)
(NASA-CR-144826; GE-76SDS4277) Avail: NTIS HC A04/MF A01 CSCL 05B

The major expected users of the LANDSAT D system and a preliminary system design of their required facilities are investigated. This system design will then be costed in order to provide an estimate of the incremental user costs necessitated by LANDSAT D. One major use of these cost estimates is as part of an overall economic cost/benefit argument being developed for the LANDSAT D system. The implication of this motive is key; the system design (and corresponding cost estimates) must be a credible one, but not necessarily an optimum one. Author

N77-13494*# General Electric Co., Philadelphia, Pa. Space Div.
LANDSAT D DATA TRANSMISSION AND DISSEMINATION STUDY Final Report
22 Nov. 1976 80 p

(Contract NAS5-23412)
(NASA-CR-144827; GE-76SDS4277) Avail: NTIS HC A05/MF A01 CSCL 17B

An assessment of the quantity of data processed by the system is discussed investigating the various methods for transmission within the system. Various methods of data storage are considered. It is concluded that the entire processing system should be located in White Sands, New Mexico. M.C.F

N77-13495*# General Electric Co., Philadelphia, Pa. Space Div.
LANDSAT D DATA PROCESSING FACILITY STUDY Final Report
22 Nov. 1976 69 p
(Contract NAS5-23412)
(NASA-CR-144828; GE-76SDS4277) Avail: NTIS HC A04/MF A01 CSCL 05B

Mission planning of the LANDSAT D is discussed which will present several major advances in the spacecraft, sensor (Thematic Mapper), ground systems and overall system design. The system provides for two data links-direct satellite to ground, and via the Tracking and Data Relay Satellite. M.C.F.

N77-13496*# General Electric Co., Philadelphia, Pa. Space Div.
LANDSAT D POSITION DETERMINATION AND CORRECTION STUDY Final Report
22 Nov. 1976 30 p refs
(Contract NAS5-23412)
(NASA-CR-144829; GE-76SDS4277) Avail: NTIS HC A03/MF A01 CSCL 08B

An assessment of accuracy of the knowledge of LANDSAT D spacecraft ephemeris data, an evaluation of the impact of expected attitude and alignment accuracies and analysis of the various options for the combining of precision ephemeris and attitude data with scene image data are provided. The potential geometric correction system in order to determine overall system costs and impact on other system elements is characterized. Author

N77-13497*# Tennessee Univ., Tullahoma. Remote Sensing Div.
REMOTE SENSING APPLICATION TO REGIONAL ACTIVITIES Semiannual Report, 15 Apr. - 15 Oct. 1976
F. Shahrokhi, N. L. Jones, and L. A. Sharber 15 Oct. 1976 24 p
(Contract NAS8-31980)
(NASA-CR-150123) Avail: NTIS HC A02/MF A01 CSCL 08F

Two agencies within the State of Tennessee were identified whereby the transfer of aerospace technology, namely remote sensing, could be applied to their stated problem areas. Their stated problem areas are wetland and land classification and strip mining studies. In both studies, LANDSAT data was analyzed with the UTSI video-input analog/digital automatic analysis and classification facility. In the West Tennessee area three land-use classifications could be distinguished; cropland, wetland, and forest. In the East Tennessee study area, measurements were submitted to statistical tests which verified the significant differences due to natural terrain, stripped areas, various stages of reclamation, water, etc. Classifications for both studies were output in the form of maps of symbols and varying shades of gray. Author

N77-13498*# Transemantics, Inc., Washington, D.C.
FURTHER DEVELOPMENT OF PHOTOGRAPHIC FILTRATION OF IMAGES FOR PURPOSES OF GEOLOGICAL INTERPRETATION
V. B. Komarov, V. F. Nomokonova, and Yu. V. Uglev NASA Mar. 1976 17 p Transl. into ENGLISH of "Dal'Neysheye Razvitiye Fotograficheskoy Fil Tratsii Izobrazhen iy v Tselyakh Geologicheskogo Deshifrirovaniya" Moscow, USSR Acad. of Sci., 1975 10 p
(Contract NASw-2792)
(NASA-TT-F-16940) Avail: NTIS HC A02/MF A01 CSCL 08G

Photographic image filtration and its development for purpose of geological interpretation. Generally speaking, image filtration is treated as its optical photographic conversion on the basis of certain rules on algorithms, corresponding to the problem of representing the result in the form of a new image, transmitting a photograph of the object being investigated. The data obtained as a result of these conversions make it possible to investigate in greater detail and to obtain analytical results in an objective and more representative form. Author

N77-13499*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
DELINEATION AND ANALYSIS OF CONTOURS ON AERIAL AND SPACE PHOTOGRAPHS, USING OPTICAL PROCESSING METHODS IN COHERENT LIGHT
Z. G. Yefimova, V. B. Romarov, B. N. Mozhayev, and D. A. Yanutsh Washington NASA Apr. 1976 19 p Transl. into ENGLISH of "Vydeleniye i Analiz Lineamentov na Aero/i Kosmicheskikh Fotosnimkakh Metodami Opticheskoy Obrabotki v Kogerentnom Svete" Moscow, 1975 9 p
(Contract NASw-2789)
(NASA-TT-F-16944) Avail: NTIS HC A02/MF A01 CSCL 05B

Apparatus for optical delineation of contours contained on aerial and space photographs is described. Resulting rose diagrams are compared with those obtained by visual interpretation of photographs of several geological formations. It was found that preliminary processing using optical filtering is most effective in delineating poorly defined images on photographs, whereas sharp contours can be studied directly from photos, using coherent spectral analysis. Author

N77-13500*# Kanner (Leo) Associates, Redwood City, Calif.
CORRELATION OF GEOPHYSICAL FIELDS AND SPACE IMAGES IN THE SOUTHERN PART OF THE SIBERIAN PLATFORM
T. V. Florenskaya Washington NASA Mar. 1976 17 p refs Transl. into ENGLISH of "Sootnosheniye Geofizicheskikh Poley i Kosmicheskikh Izobrazheniy v Yuzhnoy Chasti Sibirskoy Platform" Moscow, 1975 8 p
(Contract NASw-2790)
(NASA-TT-F-16946) Avail: NTIS HC A02/MF A01 CSCL 08G

The geological structure, geophysical fields and the substructure of the Irkutsk amphitheater are discussed. The geophysical fields over different radii are averaged for determination of the subsurface structure. The averaged fields are interpreted by means of space photographs of various scales. A definite convergence is observed between the patterns of the averaged geophysical fields. Color differentiation of the space photographs, and correspondence of different space photograph scales to the various subsurface structures are investigated. Author

N77-13501*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
EVIDENCE OF THE INNER GEOLOGIC STRUCTURE OF KAMCHATKA ON SPACE PHOTOGRAPHS OF VARIOUS SCALES
I. V. Florenskiy and P. V. Florenskiy Washington NASA Apr. 1976 17 p refs Transl. into ENGLISH of "Proyavleniye Vnutrenney Geologicheskoy Struktury Kamchatki na Kosmicheskikh Izobrazheniyakh Raznogo Masshtaba", Moscow, USSR Acad. of Sci., 1975 p 12
(Contract NASw-2789)
(NASA-TT-F-16947) Avail: NTIS HC A02/MF A01 CSCL 08G

The inner geologic structure of the Kamchatka peninsula and adjacent area is revealed by high altitude photographs. Useful information on present day and historical topography, including the location of geologically active areas, e.g. faults and volcanos, are obtained from large scale photographs of the area. Author

N77-13502*# Kanner (Leo) Associates, Redwood City, Calif.
STUDY OF REGIONS OF MODERN VOLCANISM AND ITS CONNECTION WITH PLUTONIC GEOLOGY FROM SPACE PHOTOGRAPHS
N. A. Gusev Washington NASA Mar. 1976 25 p refs Transl. into ENGLISH of the report "Izucheniye rayonov sovremennogo vulkanizma i yego svyazi s Glubinnoy geologiyev po snimkam iz kosmosa", Acad. of Sciences, USSR, Moscow, 1975 19 p
(Contract NASw-2790)
(NASA-TT-F-16948) Avail: NTIS HC A02/MF A01 CSCL 08G

Photographs and television images from numerous American and Soviet manned and unmanned spacecraft are interpreted in terms of major plutonic structures in areas of modern volcanism. The general outlines and numerous structural details of four areas of modern volcanism are discussed: north Africa (central Libya southeast to the Sudan), northern Iran (from the western part of the Little Caucasus to the Dast-i-Kavir), the Caucasus, and the Kamchatka peninsula. Author

N77-13503*# Scientific Translation Service, Santa Barbara, Calif.
THE ROLE OF SATELLITE PHOTOGRAPHY IN STUDYING THE MOVEMENTS OF BLOCKS OF THE EARTH'S CRUST
Yu. B. Bogdanov, A. V. Dolivo-Dobrovol'skiy, and E. V. Lemanov Washington NASA Apr. 1976 22 p refs Transl. into ENGLISH of the report "Rol' kosmicheskikh snimkov pri izucheniy dvizheniy blokov zemnoy kory" Moscow, Acad. of Sciences USSR, 1975 p 1-19
(Contract NASw-2791)
(NASA-TT-F-16949) Avail: NTIS HC A02/MF A01 CSCL 08G

The use of satellite photographs in studying large scale horizontal displacements of the earth's crust is discussed. Based on a study of television photographs from Soviet and American weather satellites, a diagram of the fault tectonics of the Baltic shield was constructed. Author

N77-13504*# Kanner (Leo) Associates, Redwood City, Calif.
APPLICATION OF THE METHOD OF MULTISTAGE GENERALIZATION DURING THE STUDY OF GEOLOGIC STRUCTURES OF VARIOUS SCALES (FOR EXAMPLE, NORTHERN CAUCASUS)
V. D. Skaryatin Washington NASA Mar. 1976 25 p refs Transl. into ENGLISH of "Primeneniye Metoda Mnogostrupenchatoy Generalizatsii Pri Izuchenii Geologicheskikh Struktur Raznogo Masshtaba (na Primere Sev. Kavkaza)," Moscow, USSR Acad. of Sci., 1975 15 p
(Contract NASw-2790)
(NASA-TT-F-16950) Avail: NTIS HC A02/MF A01 CSCL 08G

Images of the earth's surface were obtained from the Soyuz 9 and Soyuz 12 manned spacecraft. Aerial photographs were taken on various scale and reduced. Uncontrolled photomosaics covering the northern Caucasus were interpreted and corroborated by visual air and field observations of individual regions, for the purpose of finding tectonic lineaments and determining their interrelations among themselves. The fold structure of the region and circular formation. were studied. Identification of numerous specific tectonic lineaments, synclines, anticlines and circular formations is discussed in detail. Several requirements for interpretation of images of the earth's surface various scales are stated, and the set of general levels of the images to be used is recommended. Author

N77-13505*# Scientific Translation Service, Santa Barbara, Calif.
RULES FOR GENERALIZATION OF IMAGES OF CERTAIN INDICATORS OF GEOLOGICAL STRUCTURE ON SPACE PHOTOGRAPHS
G. B. Gonin and N. A. Yakovlev Washington NASA Mar. 1976 22 p refs Transl. into ENGLISH of the report "Zakonomernosti generalizatsii na kosmicheskikh fotosnimkakh izobrazheniy nekotorykh indikatorov geologicheskogo stroyeniya" Moscow, USSR Acad. of Sciences, 1975 p 1-15
(Contract NASw-2791)
(NASA-TT-F-16951) Avail: NTIS HC A02/MF A01 CSCL 08G

A study is made of the interrelationship between geological structure and components of the landscape. Use was made of material from satellite experiments in 1969 and 1970 with the Soyuz spacecraft. Author

N77-13506*# Scientific Translation Service, Santa Barbara, Calif.
THE ROLE OF SPACE PHOTOGRAPHS IN THE STUDY OF THE LINEAR AND ANNULAR STRUCTURES OF THE EARTH'S CRUST
A. V. Dolivo-Dobrovol'skiy and S. I. Strel'nikov Washington NASA Apr. 1976 37 p refs Transl. into ENGLISH of the report "Rol' kosmicheskikh snimkov v izuchenii lineynykh i kol'tsevykh struktur zemnoy kory" Moscow, USSR Acad. of Sciences, 1975 p 1-25
(Contract NASw-2791)
(NASA-TT-F-16952) Avail: NTIS HC A03/MF A01 CSCL 08G

A structural interpretation of data from space photography was performed to study the structure of folded regions of various ages. For comparison, a preliminary interpretation is also made of a mosaic map of the USA consisting of photographs from ERTS A. Author

N77-13507*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
A COMBINATION OF REMOTE AND GROUND-BASED METHODS FOR STUDYING YOUNG FOLDED DEFORMATIONS IN THE WESTERN KOPETDAG DEPRESSION
T. P. Ivanova and V. G. Trifonov Washington NASA Apr. 1976 19 p refs Transl. into ENGLISH of "Sochetaniye Distantsionnykh i Nazemnykh Metodov Issledovaniya Molodykh Skladchatykh Deformatsii Zapadnogo Pogruzheniya Kopetdaga", Moscow, USSR Acad. of Sci., 1975 10 p
(Contract NASw-2789)
(NASA-TT-F-16953) Avail: NTIS HC A02/MF A01 CSCL 08G

Topographic information obtained from high altitude photographs is combined with ground based measurements in an analysis of young folded deformations in the Western Kopetdag Depression. Sedimentation patterns obtained from pictures and maps of the area were supplemented by ground based measurements of cuts in the mountain plain rises and river embankments to determine the history and present development of folded structures. Author

N77-13508*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
THE PLACE OF SPACE IMAGERY IN THE COMPLEX PROCESSING OF GEOLOGICAL AND GEOPHYSICAL INFORMATION FOR THE STUDY OF THE PLUTONIC FORMATION OF THE LOWER VOLGA REGION
P. V. Florenskiy, A. S. Petrenko, L. A. Vedeshin, and B. P. Shorin-Konstantinov Washington NASA Apr. 1976 37 p refs Transl. into ENGLISH of the book "Mesto kosmicheskogo izobrazheniya pri kompleksnoy obrabotke geologo-geofizicheskoy informatsii dlya izucheniya glubinnogo stroyeniya nizhnego povolzhya" Moscow, Acad. Sci. USSR, 1975 30 p
(Contract NASw-2789)
(NASA-TT-F-16954) Avail: NTIS HC A03/MF A01 CSCL 08G

Analysis of space photographs for clarification of geological peculiarities of certain regions is one of the integral branches of regional geological investigations. The interpreted properties of photos must be artificially improved during space photo operations. Density conversion of the photo consists of emphasizing the boundaries between the stages with various imagery densities. Other types of photo conversion are also possible. Various regions were analyzed for their geological and geophysical characteristics, including gravitational and magnetic fields. As a result of a complex comparison of the existing geological and geophysical material with the data of the visual interpretation, a correlation analysis was established which made it possible to use all existing information for investigating the plutonic structure of the foundation of the lower Volga region, and to supplement existing diagrams. Author

N77-13509*# Kanner (Leo) Associates, Redwood City, Calif.
AEROSPACE AND GROUND METHODS OF STUDYING OF LATE QUATERNARY FISSURES (BASED ON THE ZONE OF THE CHIEF KOPETDAG FRACTURE)
V. G. Trifonov Washington NASA Mar. 1976 22 p refs Transl. into ENGLISH of "Aerokosmicheskiye i Nazemnyye Metody Izucheniya Pozdnechetvertichnykh Razryvov (Na Primere Zony Glavnogo Kopetdagskogo Razloma)," Moscow, Acad. of Sci. USSR, 1975 14 p
(Contract NASw-2790)
(NASA-TT-F-16955) Avail: NTIS HC A02/MF A01 CSCL 08G

A method of identification of late quaternary fissures in the Chief Kopetdag fracture zone is discussed in detail. Aerial photographs, space photographs from Meteor series satellites and LANDSAT series satellites, and ground observations are used

to identify and characterize numerous fissures. The late quaternary disturbances, intersecting relief forms of the end of the middle Pleistocene or younger ages are distinguished from ancient fissures subjected to late Quaternary erosion and linear- anthropogenic elements of the landscape (primarily lines of near horizontal underground water collecting galleries) are used to distinguish the fissures in the ground examination. Author

N77-13510# Instituto Geografico y Catastral, Madrid (Spain). Dept. de Teledeteccion.

SPACEBORNE OBSERVATION OF SPAIN WITH REMOTE SENSOR [LA OBSERVACION DE ESPANA CON SENSORES REMOTOS DESDE EL ESPACIO]

German LopezdeLemos 1975 121 p refs In SPANISH Original contains color photographs

(ISBN-84-500-6676-X) Avail: NTIS HC A06/MF A01

A summary is presented of all multispectral information obtained by spacecraft ranging from Gemini to Skylab flights. The quality of data collected and the observation systems used are evaluated. Future space programs, in which the active participation of the country is essential in order to allow rational exploration of its natural resources, are described in brief. ESA

N77-13511# Centre National d'Etudes Spatiales, Toulouse (France).

LOCALIZATION AND DATA COLLECTION OF MARINE TRACERS BY SATELLITE PASSES [LOCALISATION ET COLLECTE DES DONNEES DE TRACEURS MARINS PAR SATELLITE A DEFILEMENT]

Andre Detape Jun. 1976 54 p refs In FRENCH; ENGLISH summary

(CNES-NT-39) Avail: NTIS HC A04/MF A01

The Eole satellite's localization and data collection systems were used to carry out a variety of experiments in which drifting buoys and icebergs acted as ocean current tracers. Results of these experiments (mainly concerning data transmission and localization) are presented, and conclusions are drawn which are applicable to similar experiments performed with Nimbus 6 or with Argos localization and data collection systems, to be flown on the Tiros N satellite. ESA

N77-13512# Texas A&M Univ., College Station. Remote Sensing Center.

RADAR STUDIES OF ARCTIC ICE AND DEVELOPMENT OF A REAL-TIME ARCTIC ICE TYPE IDENTIFICATION SYSTEM Final Report

B. R. Jean 31 Jan. 1976 34 p

(Contract N60921-74-C-0008)

(AD-A025739; RSC-3005-6) Avail: NTIS HC A03/MF A01 CSCL 08/12

The Remote Sensing Center at Texas A and M University has conducted studies for the Naval Surface Weapons Center to develop a real-time, special purpose radar data processor. The purpose of this processing system is to provide ice type identification using radar scatterometer measurements. This final report documents the construction of the Real-Time Ice Classification System (RTICS) processor. Author (GRA)

N77-13513# Texas A&M Univ., College Station. Remote Sensing Center.

RADAR STUDIES OF ARCTIC ICE AND DEVELOPMENT OF A REAL-TIME ARCTIC ICE TYPE IDENTIFICATION SYSTEM Progress Report, Sep. 1974 - Jan. 1975

B. R. Jean, G. J. Reisor, M. T. Shay, and J. A. Permenter 31 Jan. 1975 110 p refs

(Contract N60921-74-C-0008)

(AD-A025862; RSC-3005-5) Avail: NTIS HC A06/MF A01 CSCL 08/12

The Remote Sensing Center at Texas A and M University is conducting studies for the Naval Surface Weapons Center to develop a real-time, special purpose radar data processor. The purpose of this processing system is to provide ice type identification using radar scatterometer measurements. This document reports on the activities of the Remote Sensing Center during the months of September 1, 1974 through January 31, 1975 directed toward that effort. Author (GRA)

N77-13514# Naval Postgraduate School, Monterey, Calif.

OCEANOGRAPHIC INVESTIGATION OF THE MARGINAL SEA-ICE ZONE OF THE CHUKCHI SEA: MIZPAC 1974 Final Report, 10 Jun. 1974 - 30 Jun. 1975

Robert G. Paquette and Robert H. Bourke May 1976 129 p refs

(ZF5255501)

(AD-A025854; NPS-58PA76051) Avail: NTIS HC A07/MF A01 CSCL 08/12

Continuous profiles of temperature and salinity (STD observations) were made in the shallow (approximately 45 m) Bering and Chukchi Seas in July 1974 as part of the MIZPAC program. In addition to measurements in ice-free waters, seven closely spaced crossings of the sea-ice margin were made along with two crossings of the Alaskan coastal zone. In all, 111 STD stations and approximately 100 XBT drops were made for which graphs and tabulations were produced of temperature, salinity, density and sound speed. South of the ice the water is sharply layered with a warm fresh layer (8-10 C and approximately 10 m thick) above a cold dense layer. At or near the sea-ice margin the layering gradually disappears with modification of isopycnals and isotherms extending to the bottom. Large scale temperature fluctuations of 0.5 to 2 C, termed mesostructure, were observed at 12-15 m depth in the first three crossings, but were weak or absent in the other crossings. Mesostructure appears to be correlated with a relatively rapid melting of the ice, and hence, probably with a strong northward flow, or a diffuse ice margin. Mesostructure formation is believed to result from non-uniform lateral mixing of waters of different temperatures but the same density, possibly modified or controlled by a complex lateral pressure field near the ice. Author (GRA)

N77-13515# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.

USE OF EARTH RESOURCES TECHNOLOGY SATELLITES (ERTS) TO DETERMINE TECTONIC CHARACTERISTICS NEAR LOW M SUB s - M SUB b EARTHQUAKES IN TIBET

R. R. Blandford and J. Gurski 2 Dec. 1975 28 p refs

(Contract F08606-76-C-0004; ARPA Order 2551; ARPA Order 1620)

(AD-A025177; SDAC-TR-75-13) Avail: NTIS HC A03/MF A01 CSCL 08/11

Examination of Earth Resources Technology Satellite (ERTS) photographs suggests intersecting faults within 10-20 kilometers of the NEIS epicenters of a cluster of low M sub s - m sub b events in Tibet. This suggests that the low Ms values may be due to some tectonic cause, for example dip slip thrust faults having high stress drop and small fault plane areas dipping about 45 deg which have been shown by Douglas to have low M sub s - m sub b. Therefore, unless the faults are steeply dipping, the low M sub s values cannot be traced to attenuation of the Rayleigh waves due to great depths of the hypocenters.

Author (GRA)

N77-13516# Resource Planning Associates, Inc., Cambridge, Mass.

THE EXPLORATION, DEVELOPMENT AND PRODUCTION OF NAVAL PETROLEUM RESERVE NUMBER 4 Final Report

19 Jul. 1976 386 p refs

(Contract FEA-CR-05-60579-00)

(PB-256714/7; FEA/S-76/368) Avail: NTIS HC A17/MF A01 CSCL 10A

The history of exploration in and the resource potential of NPR-4 are discussed. Likely levels of investment, manpower, and resources necessary to explore and develop NPR-4 are outlined. Alternative management programs for NPR-4 exploration and development are analyzed and the likely social and environmental impacts of NPR-4 exploration and development are addressed. GRA

N77-13517# Arizona Univ., Tucson. Lab. of Tree-Ring Research.

RIPARIAN DENDROCHRONOLOGY: A METHOD FOR DETERMINING FLOOD HISTORIES OF UNGAGED WATERSHEDS Completion Report, Jun. 1974 - Jul. 1976

David Laing and Charles Wayne Stockton Aug. 1976 23 p refs

(Contract DI-14-34-0001-6003)
(PB-256967/1; W76-11523; OWRT-A-058-ARIZ(1)) Avail: NTIS HC A02/MF A01 CSCL 08H

Examination of 106 crossdated tree ring cores from the riparian zone of Pine Creek near Escalante, Utah, 10 cores from Bright Angel Creek, Grand Canyon, Arizona, 8 cores from South Taylor Creek, Zion National Park, Utah, and 5 cores from the Animas River near Silverton, Colorado, has yielded the following information: (1) various riparian gymnosperm and angiosperm species crossdate with semi-arid site gymnosperms; (2) tree growth is best correlated with snowpack water equivalent; (3) flood damage to trees is manifested in growth suppression on root exposure or burial, in reaction wood on tilting, and in scarring; and (4), flood damage is very infrequent at Pine Creek from 1700 to 1880, more so from 1880 to 1909, and very frequent from 1909 to the present. GRA

N77-13518# Utah Center for Water Resources Research, Logan.
A SURVEY OF THE PHYSICAL LIMNOLOGY OF GREAT SALT LAKE Completion Report
Anching Lin Salt Lake City Utah Div. of Water Resources. 1976 88 p refs Prepared in cooperation with Utah Geological and Mineralogical Survey
(Contract DI-14-31-0001-5045; OWRT Proj. A-029-UTAH(1)) (PB-256210/6; W76-11107) Avail: NTIS HC A05/MF A01 CSCL 08H

Physical processes on the Great Salt Lake are summarized. Of some interest to limnologists is the meromixis (sustained two-layer stratification) in the south basin. The conspicuous two-layer was made possible by the presence of the railroad causeway. The stable stratification is demonstrated in the records of the last 15 years. The rate of entrainment of the chemocline obeys the general rules applicable to other large two-layer basins. The large-scale motion takes place more than 50 percent of the time. In the winter, the lake is calmer and most violent in late spring and early summer. GRA

N77-13519# Environmental Research Inst. of Michigan, Ann Arbor.
BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS Quarterly Report, 1 Apr. - 15 Jul. 1976
R. A. Shuchman, F. J. Thomson, and D. R. Lyzenga 15 Jul. 1976 25 p refs
(Contract N00014-74-C-0273; NR Proj. 389-166)
(AD-A027468; ERIM-108900-7-L) Avail: NTIS HC A02/MF A01 CSCL 08/6

During the recording period four activities took place. The second year interim report was extensively revised using comments from the sponsor and ERIM personnel and currently is in printing. A detailed program plan for 1974 ONR activities was written and distributed internally to key ERIM personnel for review. Work has commenced on obtaining critical optical properties of beach minerals needed as inputs into the Beach Environment model. And in the water modeling area, work is progressing along two fronts: (1) a computer program has been written to implement a combined water-atmosphere model, and (2) further theoretical work has indicated a small correction to be made to the existing QSS model. GRA

N77-13520# Naval Environmental Prediction Research Facility, Monterey, Calif.
CALIBRATION, EARTH LOCATION AND MAPPING PROGRAMS FOR THE NIMBUS-5 ELECTRONICALLY SCANNING MICROWAVE RADIOMETER (ESMR)
Roland Nagle Jan. 1976 131 p
(wf52551716)
(AD-A027226; NEPRF-cp/Note-24) Avail: NTIS HC A07/MF A01 CSCL 08/2

Programs to calibrate, earth-locate, and map to polar stereographic projection the Electronically Scanning Microwave Radiometer (ESMR) data from the NIMBUS-5 satellite are presented. The NASA calibration and earth location programs are converted to the CDC-6500 computer. Full descriptions of the input data tape formats are given. Documentations of all subroutines are provided. Run instructions, control card structure and program options are also presented. Grey shade images of output on three different display devices for brightness temperature ranges selected to enhance ice/sea differences are shown. Complete program listings are provided. Author (GRA)

N77-13521# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PIXEL PROBLEMS Final Report
Warren E. Grabau May 1976 89 p
(DA Proj. 4A1-62121-A-896)
(AD-A026598; WES-MP-M-76-9) Avail: NTIS HC A05/MF A01 CSCL 08/2

The exploitation of airborne and satellite-mounted multispectral cameras for the acquisition of terrain information depends upon a detailed understanding of the way in which images are formed by scanner systems, and upon methods of manipulating the radiance values that actually comprise the primary record from which the image is derived. Items discussed include: geometric distortions of the images; relations among pixel size, resolution, and contrast; variations in image geometry caused by mismatches in phase and alignment of pixel arrays; variations in image geometry caused by scanning geometry; and variations in image geometry due to pixel shape. GRA

N77-13522# Computer Sciences Corp., Silver Spring, Md. System Sciences Div.
EXTENDED STUDIES OF A QUADRILATERALIZED SPHERICAL CUBE EARTH DATA BASE Final Report, Jul. 1975 - Mar. 1976
E. M. ONeill and R. E. Laubscher 27 May 1976 114 p refs
(Contract N00228-75-C-2329)
(AD-A026294; CSC/TR-76/6008; NEPRF-TR-3-76(CSC)) Avail: NTIS HC A06/MF A01 CSCL 08/2

This report describes the results of research into a number of aspects of a proposed global meteorological data base. Subjects covered include: improvement of formulation of map transformations; a rapid method of obtaining data base coordinates from satellite elements and scanner angles; comparison of two fast-filling algorithms, the maintenance of multiple-and variable resolution data bases; and the operation of maps in the data base coordinate system. Author (GRA)

N77-13523# Army Engineer Topographic Labs., Fort Belvoir, Va.
SEMIAUTOMATIC PASS POINT DETERMINATION USING DIGITAL TECHNIQUES
Michael A. Crombie Dec. 1975 54 p refs
(DA Proj. 4A7-62707-A-855)
(AD-A026082; ETL-0051) Avail: NTIS HC A04/MF A01 CSCL 08/2

This research note describes a study performed at CSL (Computer Sciences Laboratory) to evaluate the feasibility of measuring pass points on overlapping imagery using digital correlation methods instead of utilizing conventional stereo viewing procedures. Rather than investigate the entire problem of automatic pass point mensuration including the logistics and electronic aspects, this study was limited to the photogrammetric problem. The photogrammetric problem is simply the numerical problem associated with the determination of corresponding points. The logistics aspect of the problem pertains to the organization of pass point data and density data with regard to computer storage and retrieval. The electronics aspect of the problem pertains to the scanner, to the image display system, and to the electronic marking device. The basic idea behind the proposed method is that pass points can be measured more quickly, and hopefully more accurately by digital methods than by conventional methods. It should be possible to evaluate each match numerically in the computer, thus rejecting poor determinations and reducing to zero the probability of having to remeasure the model in a triangulation exercise. Generally, an operator will display corresponding image subsets of a particular model on a display device and will visually select pass points by marking them with a cursor. Density data around a selected point will be read into computer memory, and the match (estimated with the cursor) will be refined by using correlation techniques. GRA

N77-13524# Army Engineer Topographic Labs., Fort Belvoir, Va.
REMOTE SENSOR IMAGE CAPABILITIES FOR ACQUISITION OF TERRAIN INFORMATION

Theodore C. Vogel Jun. 1976 144 p refs
(DA Proj. 4A7-62707-A-855)
(AD-A026592; ETL-0054; Rept-8) Avail: NTIS HC A07/MF A01 CSCL 17/8

This report utilizes the 1,765 terrain data requirements presented in a USAETL experimental topographic data base system to determine subjectively the overall capability of remote sensor imagery to acquire terrain and environmental information. Remote sensor imagery (RSI) capabilities are evaluated by standard image-interpreter methods and are presented as five levels of capability and two levels of required mensuration. The capability codes are as follows: A - data element can be obtained from RSI; B - data element can not presently be obtained from RSI; C - partial information obtainable; D - other collection methods required; E - data element not compatible with RSI methods; 1 - measurement in X and Y direction required; 2 - measurement in X, Y, and Z direction required. The results of these evaluations indicate that 40 percent of the terrain requirements fall in code A, 5 percent in code B, 38 percent in code C, 17 percent in code D, 13 percent in mensuration category 1, and 10 percent in category 2. Author (GRA)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N77-13525 Committee on Science and Technology (U. S. House).
INVENTORY OF ENERGY RESEARCH AND DEVELOPMENT (1973 - 1975), VOLUME 1
Washington GPO 1976 921 p refs Rept. for Subcomm. on Energy Res., Development and Demonstration of Comm. on Sci. and Technol., 94th Congr., 2d Sess., Jan. 1976 Sponsored by ERDA and NSF Prepared by ORNL
(Contract W-7405-eng-26)
(GPO-64-734-Vol-1) Avail: SOD HC $8.60

An updated assessment of the national energy resources and technology is presented. The inventory listings encompass all energy-related research and development concerned with: (1) energy sources, (2) electric power generation, transmission, distribution, and storage, (3) energy uses and conservation, (4) economic and legal aspects; and (5) health and environmental studies. Bibliographies with short description of the studies are organized in four volumes as prepared for the U. S. House of Representatives. I.M.

N77-13526 Committee on Science and Technology (U. S. House).
INVENTORY OF ENERGY RESEARCH AND DEVELOPMENT (1973 - 1975), VOLUME 2
Washington GPO 1976 1341 p refs Rept. for Subcomm. on Energy Res., Development and Demonstration of Comm. on Sci. and Technol., 94th Congr., 2d Sess., Jan. 1976 Sponsored by ERDA and NSF Prepared by ORNL
(Contract W-7405-eng-26)
(GPO-64-734-Vol-2) Avail: SOD HC $12.00
For abstract, see N77-13525.

N77-13527 Committee on Science and Technology (U. S. House).
INVENTORY OF ENERGY RESEARCH AND DEVELOPMENT (1973 - 1975), VOLUME 3
Washington GPO 1976 1317 p refs Rept. for Subcomm. on Energy Res., Development and Demonstration of Comm. on Sci. and Technol., 94th Congr., 2d Sess., Jan 1976 Sponsored by ERDA and NSF Prepared by ORNL
(Contract W-7405-eng-26)
(GPO-64-734-Vol-3) Avail: SOD HC $12.00
For abstract, see N77-13525.

N77-13528 Committee on Science and Technology (U. S. House).
INVENTORY OF ENERGY RESEARCH AND DEVELOPMENT (1973 - 1975), VOLUME 4
Washington GPO 1976 1408 p refs Rept. for Subcomm. on Energy Res., Development and Demonstration of Comm. on Sci. and Technol., 94th Congr., 2d Sess., Jan. 1976 Sponsored by ERDA and NSF Prepared by ORNL
(Contract W-7405-eng-26)
(GPO-64-734-Vol-4) Avail: SOD HC $13.00
For abstract, see N77-13525.

N77-13529 Delaware Univ., Newark.
A STOCHASTIC INSOLATION MODEL FOR TILTED SURFACES Ph.D. Thesis
Virendra Mohan Puri 1976 360 p
Avail: Univ. Microfilms Order No. 76-24251

A conversion factor, for estimating the instantaneous insolation on a surface with any orientation, from the insolation on a horizontal surface, was developed. This conversion factor was obtained by incorporating the non-istropic component of diffuse radiation in the insolation model. Thus, a serious inconsistency between the observed phenomenon and the modeling of solar radiation was dispensed with. The accuracy of this conversion factor was checked against several sets of instantaneous insolation data. The estimation of the diurnal evolution of insolation on a horizontal surface, along with the conversion factor, is sufficient to determine the insolation on a surface with any orientation at a given time of the day.
Dissert. Abstr.

N77-13530*# General Electric Co., Schenectady, N.Y.
FLOATING SUBSTRATE PROCESS: LARGE AREA SILICON SHEET TASK LOW-COST SILICON SOLAR ARRAY PROJECT Quarterly Progress Report, 21 Jun. - 24 Sep. 1976
R. N. Hall 27 Sep. 1976 22 p Sponsored in part by ERDA Prepared for JPL
(Contract NAS7-100; JPL-954350)
(NASA-CR-149322; SRD-76-111; ERDA/JPL-954350-76/3; QPR-3) Avail: NTIS HC A02/MF A01 CSCL 10A

The Seeded Growth Furnace was completed and operated extensively. Optimum thermal geometry, gas flows, and withdrawal rates were determined. Surface growth was obtained having growth velocity as high as 5-6 mm/min. The surface growth has generally taken the form of interlocking crystals and is thin enough to follow the liquid surface. Its thickness was determined to be 20 microns. A molybdenum susceptor was made for the seeded growth furnace. It is anticipated that this new design will eliminate the problems caused by films on the melt and seed crystal and lead to improved crystal structure in the silicon growth. A series of experiments was performed in order to determine whether the reactor gas streams were sources of contamination. Nitrogen reacts with silicon at 1,100 C to coat its surface with a film 30A-150A thick. Silicon heated in hydrogen at temperatures between 1,000 C and 1,200 C maintains a very clean, film-free surface. Author

N77-13531*# Varian Associates, Lexington, Mass.
SLICING OF SILICON INTO SHEET MATERIAL: SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE AREA SILICON SHEET TASK OF THE LOW COST SILICON SOLAR ARRAY PROJECT Annual Report, 9 Jan. - 19 Sep. 1976
S. C. Holden 27 Sep. 1976 101 p refs
(Contracts NAS7-100; JPL-954374)
(NASA-CR-149249; S-100-A1; ERDA/JPL-954374-76/03; AR-1) Avail: NTIS HC A06/MF A01 CSCL 10A

Multiblade slurry sawing is used to slice 10 cm diameter silicon ingots into wafers 0.024 cm thick using 0.050 cm of silicon per slice (0.026 cm kerf loss). Total slicing time is less than twenty hours, and 143 slices are produced simultaneously. Productivity (slice area per hour per blade) is shown as a function or blade load and thickness, and abrasive size. Finer abrasive slurries cause a reduction in slice productivity, and thin blades cause a reduction of wafer accuracy. Sawing induced surface damage is found to extend 18 microns into the wafer. Author

N77-13532*# General Electric Co., Philadelphia, Pa. Space Div.
DEFINITION STUDY FOR PHOTOVOLTAIC RESIDENTIAL

PROTOTYPE SYSTEM
Neal F. Shepard, Ralph Landes, and William P. Kornrumpf Sep. 1976 271 p refs
(Contract NAS3-19769)
(NASA-CR-135039; Doc-76SDS4225) Avail: NTIS HC A12/MF A01 CSCL 10B

A site evaluation was performed to assess the relative merits of different regions of the country in terms of the suitability for experimental photovoltaic powered residences. Eight sites were selected based on evaluation criteria which included population, photovoltaic systems performance and the cost of electrical energy. A parametric sensitivity analysis was performed for four selected site locations. Analytical models were developed for four different power system implementation approaches. Using the model which represents a direct (or float) charge system implementation the performance sensitivity to the following parameter variations is reported: (1) solar roof slope angle; (2) ratio of the number of series cells in the solar array to the number of series cells in the lead-acid battery; and (3) battery size. For a Cleveland site location, a system with no on site energy storage and with a maximum power tracking inverter which feeds back excess power to the utility was shown to have 19 percent greater net system output than the second place system. The experiment test plan is described. The load control and data acquisition system and the data display panel for the residence are discussed. Author

N77-13533*# Martin Marietta Corp., Denver, Colo.
DEFINITION STUDY FOR PHOTOVOLTAIC RESIDENTIAL PROTOTYPE SYSTEM Final Report
M. S. Imamura, R. Hulstrom, C. Cookson, B. H. Waldman (Brooks Waldman Assoc.), and R. Lane (Brooks Waldman Assoc.) Sep. 1976 303 p refs
(Contract NAS3-19768)
(NASA-CR-135056; MCR-76-394; ERDA/NASA-19768) Avail: NTIS HC A14/MF A01 CSCL 10A

A parametric sensitivity study and definition of the conceptual design is presented. A computer program containing the solar irradiance, solar array, and energy balance models was developed to determine the sensitivities of solar insolation and the corresponding solar array output at five sites selected for this study as well as the performance of several solar array/battery systems. A baseline electrical configuration was chosen, and three design options were recommended. The study indicates that the most sensitive parameters are the solar insolation and the inverter efficiency. The baseline PST selected is comprised of a 133 sq m solar array, 250 ampere hour battery, one to three inverters, and a full shunt regulator to limit the upper solar array voltage. A minicomputer controlled system is recommended to provide the overall control, display, and data acquisition requirements. Architectural renderings of two photovoltaic residential concepts, one above ground and the other underground, are presented. The institutional problems were defined in the areas of legal liabilities during and after installation of the PST, labor practices, building restrictions and architectural guides, and land use. Author

N77-13534*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WIND TUNNEL MEASUREMENTS OF THE TOWER SHADOW ON MODELS OF THE ERDA/NASA 100 KW WIND TURBINE TOWER
Joseph M. Savino and Lee H. Wagner Nov. 1976 37 p
(NASA-TM-X-73548; E-8984) Avail: NTIS HC A03/MF A01 CSCL 10B

Detailed wind speed profile measurements were made in the wake of 1/25 scale and 1/48 scale tower models to determine the magnitude of the speed reduction (the tower shadow). The 1/25 scale tower modeled closely the actual wind turbine including the service stairway and the equipment elevator rails on one face. The 1/48 scale model was made of all tubular members. Measurements were made on the 1/25 scale model with and without the stairway and elevator rails, and on the 1/48 all tube model without stairs and rails. The test results show that the stairs and rails were a major source of wind flow blockage. The all tubular 1/48 scale tower was found to offer less resistance to the wind than the 1/25 scale model that contained a large number of square sections. Shadow photos are included to show the extent of the blockage offered to the wind from various directions. Author

N77-13535*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STANDARDIZED PERFORMANCE TESTS OF COLLECTORS OF SOLAR THERMAL ENERGY - A FLAT-PLATE COPPER COLLECTOR WITH PARALLEL MYLAR STRIPING
Susan M. Johnson Nov. 1976 8 p ref
(NASA-TM-X-73553; E-8991) Avail: NTIS HC A02/MF A01 CSCL 10A

Basic test results are reported for a flat plate solar collector whose performance was determined in a solar simulator. The collector was tested over ranges of inlet temperatures, fluxes and one coolant flow rate. Collector efficiency is correlated in terms of inlet temperature and flux level. Author

N77-13536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STANDARDIZED PERFORMANCE TESTS OF COLLECTORS OF SOLAR THERMAL ENERGY: AN EVACUATED FLAT-PLATE COPPER COLLECTOR WITH A SERPENTINE FLOW DISTRIBUTION
Susan M. Johnson Nov. 1976 8 p ref
(NASA-TM-X-73415; E-9001) Avail: NTIS HC A02/MF A01 CSCL 10A

Basic test results are given for a flat plate solar collector whose performance was determined in the NASA-Lewis solar simulator. The collector was tested over ranges of inlet temperatures, fluxes and one coolant flow rate. Collector efficiency is correlated in terms of inlet temperature and flux level. Author

N77-13537*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS OF THE ERDA/NASA PHOTOVOLTAIC TESTS AND APPLICATIONS PROJECT
J. N. Deyo, H. W. Brandhorst, Jr., and A. F. Forestieri 18 Nov. 1976 10 p Presented to the 12th Photovoltaic Specialists Conf., 15-18 Nov. 1976; sponsored by the Inst. of Electrical and Electronic Engineers
(NASA-TM-X-73567) Avail: NTIS HC A02/MF A01 CSCL 10A

The Tests and Applications Project of the ERDA Photovoltaic Program is concerned with the testing of photovoltaic systems and the growth of their use in real terrestrial applications. This activity is an important complement to the development of low cost solar arrays by providing requirements based on application needs and stimulating markets to create demand to absorb increasing production capacity. A photovoltaic system test facility is now operational, market stimulation has been initiated through applications, and standards for terrestrial cell measurements established. Author

N77-13538*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN EXPERIMENTAL INVESTIGATION WITH ARTIFICIAL SUNLIGHT OF A SOLAR HOT-WATER HEATER
Frederick F. Simon 20 Aug. 1976 20 p refs Presented at the Joint Conf. of the Intern. Solar Energy Soc. and the Solar Energy Soc. of Can., Winnipeg, Can., 15-20 Aug. 1976
(NASA-TM-X-73534; E-8959) Avail: NTIS HC A02/MF A01 CSCL 10A

Thermal performance measurements were made of a commercial solar hot water heater in a solar simulator to determine basic performance characteristics of a traditional type of flat plate collector, with and without side reflectors (to increase the solar flux). Information on each of the following was obtained; (1) the effect of flow and incidence angle on the efficiency of a flat plate collector (but only without side reflectors); (2) transient performance under flow and nonflow conditions; (3) the effectiveness of reflectors to increase collector efficiency for a zero radiation angle at fluid temperatures required for solar air conditioning; and (4) the limits of applicability of a collector efficiency correlation based on the Hottel Whillier equation. Author

N77-13539# Stockholm Univ. (Sweden). Dept. of Meteorology.

AN ESTIMATE OF THE INTERACTION OF A LIMITED ARRAY OF WINDMILLS

Carl Crafoord Nov. 1975 43 p refs Sponsored in part by Swed. Board for Energy Source Develop.
(Contract STU-75-3130)
(DM-16) Avail: NTIS HC A03/MF A01

Using logarithmic wind profiles, the increment of roughness parameter, as an infinite array of windmills is added to an already rough surface, is calculated by a method of superposition of surface stress and windmill drag. The obtained logarithmic profiles are used to calculate the relative power of a single windmill in an unlimited array. These values are then used as limiting values for the relative power of a windmill unit in a limited array, using a simple continuity model of energy flow. Various examples are given to illustrate the efficiency of different windmill units and array sizes. Examples are also given for a tentative 100 MW group station, using different rated power units. The results are to be seen as mainly qualitative due to the crudeness of the assumptions involved. Fairly independent of chosen rated power of the individual units, group stations with small arrays (5 to 10 rows) seem to be mainly fed by horizontal flow, but for larger array sizes exceeding 50 x 50 units, the vertical flux from above becomes more important. Author (ESA)

N77-13540# Bosch (Robert) G.m.b.H., Stuttgart (West Germany). Zentralabteilung Forschung.

MANUFACTURING AND EVALUATION OF PHTHALOCYANINES AS CATALYSTS FOR FUEL CELLS Final Report

Hermann Ziener, Hermann Fischer, and Uwe Krong Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 139 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-25; BMFT-NT-145) Avail: NTIS HC A07/MF A01; ZLDI, Munich, DM 28,80

Various phthalocyanines were synthesized and their abilities to catalize the electrochemical reduction of oxygen were compared. A reaction scheme of the catalyzed oxygen reduction was worked out. Reaction-kinetic measurements show that the phthalocyanines are attacked by the hydrogen peroxide produced in the catalyzed reaction. As the phthalocyanines also decompose in acid electrolytes, they cannot be expected to be usable catalysts in acid fuel cells. Investigation of the interactions of the phthalocyanines with carbon black substrates indicate that their catalytic properties are lost when free valencies of the central atom are saturated by phenolic surface groups of the carbon black.
Author (ESA)

N77-13541# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. fuer Chemische Raketenantriebe.

PRODUCTION OF CHEMICAL ENERGY CARRIERS BY NON-EXPANDABLE ENERGY SOURCES

Joachim Nitsch 8 Jun. 1976 45 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-338)
(DLR-FB-76-32) Avail: NTIS HC A03/MF A01; DFVLR, Cologne, DM 22,40

The differei.. forms of energy (radiation, high-temperature heat, and electricity) arising from non-expandable energy sources like solar energy can be used for the production of chemical energy-carriers. Possible methods are the splitting of water by means of photolysis, thermochemical cycles, and electrolysis, as well as the storage of energy in closed loop chemical systems. These methods are described, and efficiencies and costs of the production of these energy carriers are specified. Special problems of the long-distance transportation of hydrogen produced by solar energy are described and the resulting costs estimated.
Author (ESA)

N77-13542# Thermo Electron Corp., Waltham, Mass.

A STUDY OF INPLANT ELECTRIC POWER GENERATION IN THE CHEMICAL, PETROLEUM REFINING, AND PAPER AND PULP INDUSTRIES Summary Report

S. E. Nydick, J. P. Davis, J. Dunlay, S. Fain, and R. Sukhuja Jun. 1976 18 p
(Contract FEA-CO-04-50224-00)
(PB-255658/7; TE5429-97-76; FEA/D-76/320) Avail: NTIS HC A02/MF A01 CSCL 10B

The maximum thermodynamic and economic potentials for increased inplant electric power generation by steam turbine, gas turbine, and diesel topping and steam and organic bottoming cycles were determined for the chemical, petroleum refining, and paper and pulp industries with and without government sponsored economic incentives. Institutional, legal and regulatory constraints were also assessed. GRA

N77-13543# Thermo Electron Corp., Waltham, Mass.

A STUDY OF IMPLANT ELECTRIC POWER GENERATION IN THE CHEMICAL, PETROLEUM REFINING, AND PAPER AND PULP INDUSTRIES Final Report

S. E. Nydick, J. P. Davis, J. Dunlay, S. Fain, and R. Sukhuja Jun. 1976 314 p refs
(Contract FEA-CO-04-50224-00)
(PB-255659/5; RE5429-97-76; FEA/D-76/321) Avail: NTIS HC A14/MF A01 CSCL 10B

For abstract, see N77-13542.

N77-13544# National Bureau of Standards, Washington, D.C.

SLOW CRACK GROWTH IN CERAMIC MATERIALS AT ELEVATED TEMPERATURES Final Report

A. G. Evans (Rockwell Intern., Thousand Oaks, Calif.), L. R. Russell, and D. W. Richerson (AiResearch Mfg. Co., Phoenix, Ariz.) 17 May 1974 11 p refs Repr. from Met. Transl. A, v. 6A, Apr. 1975 p 707-716 Submitted for publication Sponsored by Air Force Systems Command
(PB-255827/8) Avail: NTIS HC A02/MF A01 CSCL 10B

Techniques for studying slow crack growth at high temperatures are described. The techniques were used to obtain crack growth data for a range of silicon nitrides between 1,100 and 1,400 C. For these materials the data suggest that the slow crack growth can be characterized by the relation between crack velocity and stress intensity factor. Data obtained for mechanical and thermal fatigue modes indicate that these behaviors can be predicted with good accuracy from the isothermal, static stress parameters (for the range of conditions investigated). Finally, the application of slow crack growth data to failure prediction is described and illustrated using data for one of the materials tested. GRA

N77-13545# National Bureau of Standards, Washington, D.C.

THE FRACTURE STRESS AND ITS DEPENDENCE ON SLOW CRACK GROWTH Final Report

A. G. Evans and H. Johnson 31 May 1974 10 p refs Repr. from J. Mater. Sci., v. 10, 1975 p 214-222 Submitted for publication
(PB-255673/6) Avail: NTIS HC A02/MF A01 CSCL 10B

An analytical method is presented which enables the fracture strength, (under constant stress rate conditions) to be predicted from fracture mechanics data obtained during slow crack growth. The predicted strength characteristics are illustrated using fracture mechanics data obtained for a soda lime silicate glass. Finally, the predicted strengths are compared with strengths measured in flexure on abraded soda lime silicate glass specimens. A good correlation is obtained, indicating an equivalence between micro- and macro-crack propagation conditions for this material. GRA

N77-13546# British Steel Corp., Sheffield (England). Information Services.

REPORT ON CONFERENCE ON RAPIDLY QUENCHED METALS AND ON THE WORKSHOP ON AMORPHOUS ALLOYS

H. A. Davies Mar. 1976 27 p Conf. held at Cambridge, Mass., 17-19 Nov. 1975 and Workshop held at Boston, 20-21 Nov. 1975
(PB-256059/7; CDL/MT/2/76) Avail: NTIS HC A03/MF A01 CSCL 10B

The proceedings of two meetings on rapidly quenched and amorphous metallic materials are summarized. The main topics highlighted include quenching techniques, crystalline materials, the structure and properties of metallic glasses, and potential applications for these materials. A list of the conference papers and delegates are given as Appendices. Referring to the general subject areas, 16 were on quenching and measurement techniques, 30 on the structures and properties of crystalline phases and 60 on the formation, structures and properties of non-crystalline phases. Of the latter, 5 concentrated on the formation of metallic

glasses, 26 on structures and stabilities, 14 on mechanical properties, 7 on magnetic properties, 2 on electrical properties, 3 on corrosion and 3 on vapor- and electroless-deposited glassy phases. GRA

N77-13547# British Steel Corp., Sheffield (England). Information Charges.
FURTHER WORK TO DEVELOP THE GLOW DISCHARGE LAMP FOR IRON AND STEEL ANALYSIS
A. Butterworth Jun. 1976 12 p refs
(PB-256051/4; GS/TECH/552/1/75/C) Avail: NTIS HC A02/MF A01 CSCL 10B

Additional lines have been added to the ARL 29700B optical emission spectrometer to enable a more comprehensive assessment of the performance of the glow discharge lamp to be made. Using low alloy steels, three different methods of calibration have been examined, and for many of the lines, calibration curves have been prepared using high alloy binary steel standards. Good precision was obtained which compares favorably with similar results for normal arc/spark emission methods. This work continues to demonstrate the high potential of the glow discharge lamp as an emission spectroscopy source for application to iron and steel analysis. Calibration curves for cobalt, manganese, vanadium, nickel, molybdenum, and tungsten are presented.GRA

N77-13548# Naval Postgraduate School, Monterey, Calif.
HYDRAULIC RAM EFFECT ON COMPOSITE FUEL CELL ENTRY WALLS M.S. Thesis
Alfred Nicholas Duva, Jr. Mar. 1976 76 p refs
(AD-A024832) Avail: NTIS HC A05/MF A01 CSCL 10/2

Catastrophic failure of a partially filled aircraft fuel cell due to impact and penetration by a high speed projectile often occurs due to a phenomenon known as hydraulic ram. The structural response of the fuel tank walls to hydraulic ram should be of vital concern to the designers of aircraft fuel cells. Considerable research has been conducted to determine the effects of hydraulic ram on metallic fuel cells, but very little attention has been given to fuel cells made with the new advanced composite materials. The purpose of this research is to examine the various effects of hydraulic ram on a graphite/epoxy wall when subjected to penetration by a .222 caliber projectile. Eight hydraulic ram tests are made on a clamped 11-inch square plate 0.067 inches thick at projectile velocities between 2,600 and 2,800 fps. The engineering properties of the laminate are determined both analytically and experimentally. The low velocity shots caused only slight damage to the plate. At the higher velocities, the hydraulic ram caused considerable damage, including total severance of the plate from its clamped support over much of the outer perimeter. The results of this research illustrate the importance of the method of attachment of the composite wall at its boundaries. Author (GRA)

N77-13549# Institute of Gas Technology, Chicago, Ill.
BURNER DESIGN CRITERIA FOR CONTROL OF NOx FROM NATURAL GAS COMBUSTION. VOLUME 2: RAW DATA AND EXPERIMENTAL RESULTS Final Report, Jun. 1973 - Sep. 1975
D. R. Shoffstall Jun. 1976 416 p
(Contract EPA-68-02-1360)
(PB-256806/1; EPA-600/2-76-098-b-Vol-2) Avail: NTIS HC A18/MF A01 CSCL 13A

Experiments were conducted with natural gas to determine the relationship between combustion aerodynamics and pollution emission characteristics of industrial burners. The procedure used to select the test burners is discussed. Detailed flame characterizations of baseline operations assembled from in-the-flame temperature, gas species and flow direction data analysis are included. Similar in-the-flame studies were made for control conditions which minimized emissions for each burner type. Raw data collected from the input/output trials are also included. GRA

N77-13550# Skidmore, Owings and Merrill, Washington, D. C.
BONNEVILLE POWER ADMINISTRATION ELECTRIC ENERGY CONSERVATION STUDY Final Report
Jun. 1976 333 p refs
(Contract DI-14-03-6100N)
(PB-256766/7) Avail: NTIS HC A15/MF A01 CSCL 10B

The potential for conservation to reduce forecasted electric energy needs in the Pacific Northwest is analyzed. The report outlines energy savings and impacts for a variety of conservation strategies. Energy conservation is defined as improving the efficiency of energy use. None of the measures require curtailment of energy-using practices. The potential for conservation in the region ranges from 5 to 33 percent of the 1995 forecast demand. GRA

N77-13551# Exxon Research and Engineering Co., Linden, N.J. Government Research Lab.
CARBON OXIDATION CATALYST MECHANISM STUDY FOR FUEL CELLS Final Report, Oct. 1974 - Jun. 1975
Yen-Chi Pan Mar. 1976 69 p refs
(Contract EPA-68-02-1831)
(PB-256420/1; EXXON/GRU.2DYBA.75/715520; EPA-600/2-76-057) Avail: NTIS HC A04/MF A01 CSCL 10B

The electrocatalytic behavior of carbon and the reaction kinetics of oxygen reduction are discussed to determine whether any combination of conditions, (temperature, electrolyte concentration, and pH value) exist in which a carbon cathode could operate sufficiently well to be used in a practical fuel cell. A systematic examination of the electrocatalytic activity for oxygen reduction in various electrolytes was conducted, using a rotating ring-disk electrode. GRA

N77-13552# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
WIND ENERGY CONVERSION Progress Report, 15 Jul. 1975 - 15 Feb. 1976
R. H. Miller, M. Martinez-Sanchez, J. Dugundji, E. Larrabee, and T. Humes 15 Feb. 1976 183 p refs
(Grant NSF AER-75-00826)
(PB-256198/3; ASRL-TR-184-2; NSF/RA-760160) Avail: NTIS HC A09/MF A01 CSCL 10B

Testing of a wind tunnel model and aeroelastic analyses indicate the scope of the problem involved in selecting a suitable speed for a wind turbine. It is proposed that, at least for conventional rotor type wind turbines, a constant tip speed rather than a constant ratio of tip speed to wind speed is a more satisfactory design solution. The penalty involved in maintaining constant tip speed was investigated in order to determine whether control should be considered for a constant speed or for variable speed (constant tip speed ratio) wind turbine. As a result of experience with aeroelastic analyses it was decided to concentrate on the constant speed configuration. Airloads in the presence of wind shear and gust were also investigated. GRA

N77-13553# Gilbert Associates, Inc., Reading, Pa.
DESIGN PHASE UTILITY ANALYSIS FOR GAS TURBINE AND COMBINED CYCLE PLANTS Final Report
P. A. Kadlec and O. R. Martins 12 Aug. 1976 78 p refs
(Contract FEA-CO-05-60575-00)
(PB-256665/1; GAI-1915; FEA/G-76/369) Avail: NTIS HC A05/MF A01 CSCL 10B

Analysis is made of factors, trends and effects related to the usage of gas turbine (GT) and combined cycle (CC) power plants for base, intermediate and peaking load service as compared to alternate fossil fuel units for both public and privately owned utilities. Future usage of GT and CC units to supply base, intermediate and peak load needs is predicted. The engineering advantages and disadvantages of CC and GT technologies are identified. A definition for combined cycle power plants is presented. GRA

N77-13554# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
MARITIME AND CONSTRUCTION ASPECTS OF OCEAN THERMAL ENERGY CONVERSION (OTEC) PLANT SHIPS, DETAILED REPORT
W. H. Avery, R. W. Blevins, G. L. Dugger, and E. J. Francis Apr. 1976 232 p refs
(Contract MA-5-38054)
(PB-257444/0; APL/JHU-SR-76-1B; MA-RD-940-T76074) Avail: NTIS HC A11/MF A01 CSCL 10A

The development of Ocean Thermal Energy Conversion (OTEC) plant-ships to produce energy-intensive products at sea is

considered. Such OTEC plant-ships would use the temperature difference between the warm surface layer and the cold deep layers of a tropical ocean to drive a heat engine to produce electric power that, in turn, would be used to produce ammonia, aluminum, liquid hydrogen, and/or other products. The construction, deployment, operation, and shipping support of these plant-ships are discussed. GRA

N77-13555# Federal Energy Administration, Washington, D.C.
FINAL ASSESSMENT OF THE ENVIRONMENTAL IMPACTS OF THE STATE ENERGY CONSERVATION PROGRAM (PUBLIC LAW 94-163, TITLE III, PART C, THE ENERGY POLICY AND CONSERVATION ACT)
Apr. 1976 92 p
(PB-256044/9; FEA/D-76/363) Avail: NTIS HC A05/MF A01 CSCL 10A

The Energy Policy and Conservation Act provides for a program to be administered by each state in which the State and Federal Governments may work in partnership to develop comprehensive energy conservation plans. An environmental analysis of the cumulative national impact of the State Energy Conservation Program is presented. Environmental impact data that can be employed by the states in assessing the environmental impacts of energy conservation measures which might be a part of their programs are also included. GRA

N77-13556# Northwestern Univ., Evanston, Ill. Technological Inst.
HEAT EXTRACTION FROM HOT DRY ROCK MASSES Progress Report, 1 Aug. 1975 - 31 Jan. 1976
J. Weertman, J. D. Achenbach, Z. P. Bazant, J. Dundurs, L. M. Keer, T. Mura, and S. Nemat-Nasser Apr. 1976 125 p refs (Grant NSF AER-75-00187)
(PB-256775/8; NSF/RA-760181) Avail: NTIS HC A06/MF A01 CSCL 08I

The following topics are reported: (1) analytic study of crack growth and shape; (2) finite element solution of geothermal energy extraction; (3) fluid flow through cracks; (4) model experiments; and (5) seismic detection of hydraulically induced fractures. GRA

N77-13557# Army Construction Engineering Research Lab., Champaign, Ill.
METHOD FOR ESTIMATING SOLAR HEATING AND COOLING SYSTEM PERFORMANCE
Douglas C. Hittle, George N. Walton, and Donald F. Holshouser 1976 14 p refs
(AD-A026041) Avail: NTIS HC A02/MF A01 CSCL 13/1

During FY75 the Construction Engineering Research Laboratory, under funding from the Office of the Chief of Engineers, engaged in a research effort to develop a method for the preliminary determination of the feasibility of heating and cooling buildings with solar energy. The principal objective of the work effort was to provide a simple means for estimating the expected performance of a given solar heating and cooling system when applied to typical buildings in various regions of the country. GRA

N77-13558# Naval Surface Weapons Center, White Oak, Md.
STRUCTURE OF LITHIUM-BORON ALLOYS AND THEIR PERFORMANCE AS POTENTIAL ANODES FOR HIGH POWER MOLTEN SALT BATTERIES Progress Report, 1 Aug. 1974 - 30 Jun. 1975
Stanley D. James and Larry E. DeVries 1 Mar. 1976 33 p refs
(ZR0130101)
(AD-A025202; NSWC/WOL/TR-76-22) Avail: NTIS HC A03/MF A01 CSCL 10/3

Anodic discharge curves in the LiCl-KCl eutectic melt have been obtained for two lithium-boron alloys (70 and 80 weight % Li) between 673 and 873 K (400 and 600 C) and from 2-8 A/sq cm. The behavior of Li contained in wicks of porous Ni was also studied for comparison. Calculated Li contents for Li-B alloy anodes, at the main break in curvature of discharge curves, clustered closely around 0.67 mole fraction Li. This is considered strong evidence for the existence of a compound Li2B in this alloy system. Between 748 and 873 K (475 and 600 C) and up to at least 8 A/sq cm, there is no diffusional limitations to the anodic extraction of Li from the Li-B alloys. The shape of discharge curves, the lack of anodic diffusional limitation and the longer low-V plateaus of the alloy richer in Li, are consistent with the following picture of the discharge process. The discharging material behaves like a sponge of solid Li2B compound containing a Li-rich, Li-B liquid alloy, probably a conjugate phase to the Li2B compound. Lithium anodizes into the melt at constant V out of this liquid alloy until it is wholly transformed to solid Li2B. This process constitutes the main plateau of alloy discharge curves. At this point (the main break in discharge curves) voltage rises to values where tighter-bound Li can be anodized out of the decomposing compound. The Li-B alloy electrodes are markedly superior to the Li-Ni wicks both in gravimetric coulombic capacity and in the ability to retain Li at high temperatures. Useful coulombic capacities of the Li-B alloys ranged up to 7,700 coulombs per g of (Li-B) at about 3V versus a chlorine reference electrode. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N77-13559 Cincinnati Univ., Ohio.
STUDY OF TIME INTEGRATED AIR SAMPLING TECHNIQUES USING SOLID ADSORBENTS FOR CARBON DISULFIDE VAPORS Ph.D. Thesis
Roger Eugene Hallstein 1976 133 p
Avail: Univ. Microfilms Order No. 76-25474

The adsorption/desorption characteristics of certain porous polymer adsorbents for carbon disulfide vapor were evaluated critically. Porous polymers were selected as the solid adsorbent because of their greatest potential for a single type of adsorbent and the fact that heat instead of solvents can be used to remove the sample. Carbon disulfide was chosen as the solvent vapor to study since no acceptable techniques using a solid adsorbent and a gas chromatograph are developed for this industrial air contaminant. This porous polymer was fully evaluated for its adsorption and desorption performance under various temperature, humidity, flow rate and concentration conditions. An analytical procedure was then developed, and a gas chromatograph was used as the analytical instrument for carbon disulfide vapor. Dissert. Abstr.

N77-13560 British Library Lending Div., Boston Spa (England).
COMBATING ENVIRONMENTAL POLLUTION IN THE IRON AND STEEL INDUSTRY
V. I. Petrikeev 1976 10 p Transl. into ENGLISH from Stal (USSR), no. 4, 1976 p 289-292
(BLL-M-25433-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The proceedings of the 7th Plenary session of the Central Board of the Scientific-Technical Society of the Iron and Steel Industry are discussed. The measures already taken in the industry to reduce the environmental pollution it produces are outlined, and the main tasks remaining are listed. Besides the introduction of more-efficient cleaning methods attention is being given to reducing the volumes of gas and water to be cleaned. Author

N77-13561 Texas Univ., Austin.
AN APPLICATION OF A REGIONAL METHODOLOGY TO ESTIMATE POINT AND NON-POINT POLLUTIONAL LOADS DISCHARGED INTO A STREAM Ph.D. Thesis
Raul Cuellar-Chauez 1976 119 p
Avail: Univ. Microfilms Order No. 76-26617

Evaluation of water quality changes in a stream requires identification and quantification of all point and nonpoint sources of pollutants in the watershed. Results of a recent U.S. Environmental Protection Agency study indicated that nonpoint sources were affecting downstream water quality of most of the urban areas studied to a greater extent than point sources. Municipal and industrial wastewater discharges differ from urban rural surface storm runoff, in flow and water quality patterns with respect to time. A methodology was applied in the Lower Rio Grande Valley of Texas in order to consider point and nonpoint sources in a regional analysis of a stream. Identification and quantification of the sources of pollutants along the Main

Floodway-Arroyo Colorado watercourse system were made, as well as an analysis of flows and quality characteristics in this stream. Dissert. Abstr.

N77-13562 Institut d'Aeronomie Spatiale de Belgique, Brussels.
SCIENTIFIC RESPONSIBLE AWARENESS OF ATMOSPHERIC ENVIRONMENT
M. Nicolet 1976 35 p In FRENCH Presented at the Ann. Plenary Meeting of the Belg. Roy. Acad. of Sci., Brussels, 16 Dec. 1975 Submitted for publication
(Aeronomica-Acta-A-159-1976) Avail: Issuing Activity

An illustration is given using the specific problem of atmospheric ozone balance maintenance. The importance of atmospheric ozone balance, which is insured by both its photochemical formation and its chemical destruction, is emphasized. With ozone limiting the penetration of abiotic solar ultraviolet radiation, any modification of its composition leads to important consequences such as air pollution. Causes of this pollution are discussed, namely, nitrogen oxide increase due to supersonic flight and hydrocarbon chlorides and methyl bromide intrusion into the stratosphere due to industries, etc. The aeronomic processes provoking this air pollution are detailed. ESA

N77-13563*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA GLOBAL ATMOSPHERIC SAMPLING PROGRAM (GASP) DATA REPORT FOR TAPE VL0004
J. D. Holdeman, F. M. Humenik, and E. A. Lezberg Nov. 1976 47 p refs
(NASA-TM-X-73574; E-9023) Avail: NTIS HC A03/MF A01 CSCL 04A

The NASA Global Atmospheric Sampling Program (GASP) is obtaining measurements of atmospheric trace constituents in the upper troposphere and lower stratosphere using fully automated air sampling systems on board several commercial B-747 aircraft in routine airline service. Atmospheric ozone, water vapor, and related flight and meteorological data were obtained during 139 flights of a United Airlines B-747 and a Pan American World Airways B-747 from December 1975 through March 1976. In addition, sample bottles were exposed during three flights and analyzed for trichlorofluoromethane, and filter samples were exposed during five flights and analyzed for sulfates, nitrates, and chlorides. Flight routes and dates, instrumentation, data processing procedures, data tape specifications, and selected analyses are discussed. Author

N77-13564# Monsanto Research Corp., Dayton, Ohio.
SOURCE ASSESSMENT: PRIORITIZATION OF STATIONARY AIR POLLUTION SOURCES. MODEL DESCRIPTION Final Report, Mar. - Oct. 1975
Edward C. Eimutis Feb. 1976 83 p refs
(Contract EPA-68-02-1874)
(PB-253479/0; MRC-DA-508; EPA-600/2-76-032-a) Avail: NTIS HC A05/MF A01 CSCL 13B

The report describes a prioritization model for the rank-ordering of stationary air pollution sources. The source types were rank-ordered or prioritized by computing a relative environmental impact factor for each source type. A priority listing was developed for each of four categories: combustion, organic materials, inorganic materials, and open sources. The report also describes both the actual application of the model and the types of calculations that were performed depending upon the degree of input aggregation. The report also gives detailed examples of use, as well as results of sensitivity analysis, showing how the prioritization model responds to input changes. GRA

N77-13565# National Enforcement Investigations Center, Denver, Colo.
CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, NATIONAL PLANT, PITTSBURGH, PENNSYLVANIA, 3-6 FEBRUARY 1976
May 1976 113 p refs Prepared in cooperation with EPA, Philadelphia, region 3
(PB-255585/2; EPA-330/2-76-026) Avail: NTIS HC A06/MF A01 CSCL 13B

The National Steel Plant is located on the Monongahela River at McKeesport, Pa. Process water is pumped from the Monongahela River and is supplemented with treated water purchased from the City of McKeesport. Wastewater is discharged from outfalls 001-010. All wasteloads discharged from outfalls 002-010 are computed on a net basis. GRA

N77-13566# National Enforcement Investigations Center, Denver, Colo.
CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, CLAIRTON WORKS, PITTSBURGH, PENNSYLVANIA, 28-31 JANUARY 1976
May 1976 136 p refs Prepared in cooperation with EPA, Philadelphia, region 3
(PB-255586/0; EPA-330/2-76-025) Avail: NTIS HC A07/MF A01 CSCL 13B

The United States Steel Corporation (USSC) Clairton Works consists of a coke plant, chemical plant and steel plant. The facility is in the city of Clairton on the Monongahela River, about 29 km (18 mi) upstream of the confluence of the Ohio, Monongahela and Allegheny Rivers. The major activity at Clairton is the coking of coal and subsequent recovery of chemicals. The steel plant includes a blast furnace for either basic iron or ferromanganese production and four steel finishing mills. Wastewater is discharged daily into the Monongahela River through a number of outfalls. Several other outfalls discharge into Peters Creek, a tributary of the Monongahela River. A dye study was conducted on some of the outfalls during December 15-18, 1975 to determine if the USSC sampling locations are representative. In-plant monitoring was conducted during January 28-31, 1976. The results of the survey are summarized. GRA

N77-13567# National Enforcement Investigations Center, Denver, Colo.
CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, IRVIN PLANT, PITTSBURGH, PENNSYLVANIA, 18-28 AUGUST 1975
Dec. 1975 70 p refs Prepared in cooperation with EPA, Philadelphia, region 3
(PB-255588/6; EPA-330/2-75-012) Avail: NTIS HC A04/MF A01 CSCL 13B

The Irvin Plant is primarily a steel finishing operation. An acid neutralization treatment facility, a waste oil treatment facility and a domestic wastewater treatment facility are located at the plant. Waste oil treatment effluent is discharged through one outfall and domestic effluent through another. The discharges from the plant were studied. GRA

N77-13568# National Enforcement Investigations Center, Denver, Colo.
CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, EDGAR THOMSON PLANT, PITTSBURGH, PENNSYLVANIA, 22 JULY - 5 AUGUST 1975
Dec. 1975 75 p refs Prepared in cooperation with EPA, Philadelphia, region 3
(PB-255589/4; EPA-330/2-75-011) Avail: NTIS HC A04/MF A01 CSCL 13B

The United States Steel Corporation (USSC) Edgar Thomson (ET) Plant is a basic steel production facility producing steel ingots which in turn are rolled into slabs. The plant consists of a sintering plant, five blast furnaces, two basic oxygen furnaces, a 44-inch slab mill and an ingot mold foundry. Two intake stations on the Monongahela River supply the facility with up to 795,000 cu m/day (210 mgd) of water with only a small portion of this water being treated. The plant discharges wastewater from five outfalls which, with the exception of one, discharge into the Monongahela River. This outfall discharges to Turtle Creek, a tributary of the Monongahela River. In-plant monitoring was conducted during the period July 22 to August 5, 1975. The findings of the survey are discussed and the loads discharged during the above period are compared with the waste load limitations proposed by the USSC March 3, 1975. GRA

N77-13569# Industrial Environmental Research Lab., Research Triangle Park, N. C.
PROCEEDINGS OF THE STATIONARY SOURCE COMBUSTION SYMPOSIUM. VOLUME 1. FUNDAMENTAL RESEARCH

Joshua S. Bowen and Robert E. Hall Jun. 1976 470 p refs Sponsored by EPA 3 Vol.
(PB-256320/3; EPA-600/2-76-152-a) Avail: NTIS HC A20/MF A01 CSCL 21B

The proceedings document the 37 presentations made during the Stationary Source Combustion Symposium held in Atlanta, Ga., September 24-26, 1975. Sponsored by the Combustion Research Branch of EPA's Industrial Environmental Research Laboratory, the symposium dealt with subjects related both to developing improved combustion technology for the reduction of air pollutant emissions from stationary sources, and to improving equipment efficiency. The symposium was intended to provide contractor, industrial, and Government representatives with the latest information on EPA in-house and contractor combustion research projects related to pollution control, with emphasis on reducing nitrogen oxides. GRA

N77-13570# Industrial Environmental Research Lab., Research Triangle Park, N. C.
PROCEEDINGS OF THE STATIONARY SOURCE COMBUSTION SYMPOSIUM. VOLUME 2. FUELS AND PROCESS RESEARCH AND DEVELOPMENT
Joshua S. Bowen and Robert E. Hall Jun. 1976 424 p refs Sponsored by EPA 3 Vol.
(PB-256321/1; EPA-600/2-76-152-b) Avail: NTIS CSCL 21B

Contents: Assessment of combustion and emission characteristics of methanol and other alternate fuels; Burner design criteria for control of pollutant emissions from natural gas flames; Integrated low emission residential furnace; The control of pollutant emissions from oil fired package boilers; Pilot scale investigation of catalytic combustion concepts for industrial and residential applications; The optimization of burner design parameters to reduce NOx formation in pulverized coal and heavy oil flames; Pilot scale investigation of combustion modification techniques for NOx control in industrial and utility boilers; Overfire air as an NOx control technique for tangential coal-fired boilers; Control of NOx formation in wall coal-fired boilers; The effect of additives in reducing particulate emissions from residual oil combustion; System design for power generation from low Btu gas boilers. GRA

N77-13571# Environmental Sciences Research Lab., Research Triangle Park, N.C. Meteorology and Assessment Div.
CALCULATED ACTINIC FLUXES (290-700 nm) FOR AIR POLLUTION PHOTOCHEMISTRY APPLICATIONS
James T. Peterson Jun. 1976 63 p refs
(PB-255819/5; EPA-600/4-76-025) Avail: NTIS HC A04/MF A01 CSCL 04A

Calculations are presented of the actinic (spherically integrated) solar flux from 290 to 700 nm at solar zenith angles between 0 and 86 deg. A radiative transfer program that accounts for molecular scattering, ozone absorption, and aerosol scattering and absorption is used. The variation of the actinic flux with altitude above the surface is discussed with emphasis on the change through the lowest kilometer of the atmosphere. The flux values are compared to those of Leighton; the differences in the methodology and input data between the two studies are illustrated. GRA

N77-13572# Naval Research Lab., Washington, D.C.
AMBIENT AIR QUALITY DATA MANAGEMENT AT NRL Final Report
A. Stamulis, R. L. Fluornoy, and Lynn K. Jones Apr. 1976 36 p refs
(AD-A025024; NRL-MR-3261) Avail: NTIS HC A03/MF A01 CSCL 13/2

The instruments housed in the NRL air monitoring station are described. A description of the computer program to handle the data generated by the air pollution analyzers is presented including the program routine and subroutines. The presentation outlined in this report should be useful to those facilities interested in maintaining an air monitoring station and arranging the air quality data in a useful and meaningful format. GRA

N77-13573# IIT Research Inst., Chicago, Ill.
TURBINE-ENGINE-PARTICULATE SAMPLER: DESIGN STUDY Final Report, 1 Feb. - 30 Jun. 1975
Donald L. Fenton May 1976 69 p refs
(Contract F41609-75-C-0024; AF Proj. 7164)
(AD-A027499; IITRI-C6330-5; SAM-TR-76-1) Avail: NTIS HC A04/MF A01 CSCL 13/2

A turbine-engine-particulate sampler was designed to maximize overall collected mass for subsequent polynuclear aromatic (PNA) compounds and polycyclic aromatic material analyses. Special design features significantly reduce sample degradation problems and constrain total sampling time to 30 minutes. The sampling concept is a result of a comprehensive literature search and thorough analysis. This PNA sampler extracts the exhaust sample through a multiple-point probe, transports the sample to a conditioner, and collects the particles onto a glass-fiber filter. The conditioner not only reduces the sample temperature, permitting condensation, but also simulates the atmospheric dilution process. A bypass circuit permits sampler operation without actually collecting particles. Author (GRA)

N77-13574# Acurex Corp., Mountain View, Calif. Aerotherm Div.
FEASIBILITY OF A DIRECT CONTACT HEAT AND EMISSION LOSS PREVENTION SYSTEM FOR AREA SOURCE FURNACES Final Report, Jun. - Oct. 1975
R. J. Schreiber and G. G. Poe Apr. 1976 122 p refs
(Contract EPA-68-02-1318)
(PB-256405/2; Aerotherm-75-179; EPA-600/2-76-121) Avail: NTIS HC A06/MF A01 CSCL 13A

The feasibility of a retrofit device is discussed for recovering emissions and waste heat from the flue of a residential furnace. The device resembles a small wet scrubber and collects virtually all of the oil-fired furnace's particulate, NO2, SO3, and UHC, as well as increasing the unit's efficiency to greater than 95%. The payback period is highly dependent on fuel cost. A laboratory test program is recommended to determine operating characteristics. GRA

N77-13575# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
RECLAMATION OF WASTEWATER BY APPLICATION ON LAND
Iskandar K. Iskandar and Daniel C. Leggett 1976 15 p refs
(AD-A026050) Avail: NTIS HC A02/MF A01 CSCL 13/2

The objective of this paper is to discuss the results of two years of operation of prototype slow-infiltration land treatment systems. Information derived from this work is needed to provide guidance to Corps of Engineers Division and District sanitary engineers on design, operation and management of land treatment systems. GRA

N77-13576# Air Force Civil Engineering Center, Tyndall AFB, Fla.
CONTINUOUS ON-LINE MONITORING OF TOTAL ORGANIC CARBON Final Report, Jan. - Apr. 1975
Brian D. Bennett Aug. 1975 26 p refs
(AF Proj. 2054)
(AD-A026175; AFCEC-TR-75-16) Avail: NTIS HC A03/MF A01 CSCL 13/2

Continuous on-line monitoring of total organic carbon was performed at an Air Force sewage treatment facility using an Ionics Total Organic Carbon Analyzer. This instrument was installed and operated to determine its potential use in Air Force monitoring programs and the validity of a total organic carbon (TOC) to biochemical oxygen demand (BOD) correlation for the wastewater analyzed. Information was obtained on the operation and required servicing for proper instrument application. Analysis of data collected during this study indicated that a valid long term correlation of TOC:BOD could be used to effectively monitor treatment plant performance. Author (GRA)

N77-13577# Naval Civil Engineering Lab., Port Hueneme, Calif.
MATERIALS FOR OIL SPILL CONTAINMENT BOOM Final Technical Note, Apr. - Jul. 1975
Donald E. Brunner Jun. 1976 34 p refs
(AD-A026139; CEL-TN-1440) Avail: NTIS HC A03/MF A01 CSCL 13/2

A study was recently conducted to investigate containment boom material requirements, which were defined and weighted

in terms of their relative importance. When available, standard test procedures for use in evaluating each requirement were identified. Both substrate materials and coatings to be applied are discussed in this report. From the limited investigation, polyester was the most promising substrate material, followed by nylon. Chlorosulfonated polyethylene, polyurethane with a polyether base, chlorinated polyethylene, and poly(vinyl chloride) formulated with ultraviolet inhibitors are the most promising coating materials. One substrate and coating combination could not be identified as best because of the variation in material properties. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N77-13578 Stanford Univ., Calif.
TELESEISMIC TRAVEL TIME RESIDUALS APPLIED TO THE QUESTION OF P-VELOCITY CHANGES PRECEDING EARTHQUAKES IN CENTRAL AND NORTHERN CALIFORNIA Ph.D. Thesis
Chris Harold Cramer 1976 173 p
Avail: Univ. Microfilms Order No. 76-25985

Teleseismic travel time arrivals were analyzed for changes prior to three moderate-sized earthquakes in central and northern California. Common source and travel path effects were eliminated by using a two station or relative travel time residual technique. An empirical azimuthal correction to the relative residual data was devised for combining into one time plot teleseismic data from a broad range of azimuths to source. This approach allows one to look at variations in relative residuals about their normal values and provides the capability of reducing data scatter to +0.1 sec. For very well recorded data from limited source regions, data scatter can be reduced to +0.05 sec. Generally, travel time residuals are stable to +0.1 second in central and northern California with no indications of precursory changes on the order of the several tenths of a second reported for other seismically active regions in the world. Dissert. Abstr.

N77-13579 National Lending Library for Science and Technology, Boston Spa (England).
ANCHIMONOMINERAL ACCUMULATIONS OF PYROCHLORE: NEW TYPE OF TANTALUM-NIOBIUM ORES
V. V. Arkhangelskaya, A. S. Babkin, A. I. Ginsburg, and M. I. Tulohonov [1975] 19 p refs Transl. into ENGLISH from Geol. of Ore Deposits (USSR), v. 15, no. 3, May - Jun. 1973 p 112-116
(NLL-M-24191-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

In purely pyrochlore type rocks, the ratio of tantalum to niobium is in the region of 1:40 to 1:10, and the extraction of tantalum from such rocks is not economically feasible. In deposits that are rich in tantalum, the main material is a tantalum containing pyrochlore in which the ration of tantalum to niobium is in the region of 1:5 to 1:14. The tantalum pentoxide is in concentrations of from 1 to 5 percent, and the ores from such deposits are considered as an important tantalum-niobium raw material. Ores from such deposits are closer in value to genuine tantalum deposits. Author

N77-13580 Saint Louis Univ., Mo.
CONTEMPORARY EARTHQUAKE MECHANICS IN CENTRAL UNITED STATES Ph.D. Thesis
Ronald Leon Street 1976 271 p
Avail: Univ. Microfilms Order No. 76-25824

The results of a study of contemporary earthquakes within central United States between 1961 and mid-1974 are presented. Events ranging from m sub b = 0.5 to m sub b = 4.9 are relatively scaled by the vertical component of their Lg waves and empirically related to one of the seismic source parameters, and the seismic moment. Many of the larger earthquakes were also investigated for their focal mechanism solutions. Spectra of more than three hundred short period, vertical component Lg waves of 78 earthquakes in the central United States were determined. From these, an empirical relationship between the long period level of the Lg displacement spectrum and seismic moment were developed. There is a consistency between the corner period and the seismic moment, which implies a uniformity of earthquake processes in the central United States over a wide range of event sizes as opposed to California. Dissert. Abstr.

N77-13581 Ohio State Univ., Columbus.
MICROPARTICLES, ICE SHEETS AND CLIMATE Ph.D. Thesis
Lonnie Gene Thompson 1976 216 p
Avail: Univ. Microfilms Order No. 76-24699

The ice sheets of the world provide ideal locations for the investigation of changes with time in such climatic parameters as temperature and variations in concentration, size distribution and composition of dust. A comparison of particle concentrations and size distributions in an ice core from the Northern Hemisphere with one from the Southern Hemisphere is presented. In both cores the highest concentrations of particles occur where O18/O16 ratios exhibit the greatest negative values. During the Wisconsinan Glacial Stage the concentration of small diameter particles (0.65 to 0.82 micrometers) was as much as 100 times greater than the mean Holocene concentrations in the Camp Century core and more than 4 times greater than mean Holocene values for the Byrd core. The microparticle data from these deep ice cores offer renewed support for the volcanic theory of glaciation. Therefore, a volcanic theory of climatic change is put forth. Dissert. Abstr.

N77-13582 Stanford Univ., Calif.
INVESTIGATION OF THE BEHAVIOR OF F-REGION BARIUM RELEASES IN THE EQUATORIAL IONOSPHERE Ph.D. Thesis
Dan Robert McDaniel 1976 116 p
Avail: Univ. Microfilms Order No. 76-26038

These experiments were conducted at Kwajalein, Marshall Islands. A qualitative assessment of the Kwajalein environment was made to determine the suitability of that location for conducting radar tracking experiments involving the use of barium ion clouds. In addition a quantitative assessment was made of the applicability of existing theory to the equatorial environment. The barium releases were made in two series: four releases in June 1973, and three releases in January 1975. Release altitude was 185 km in all cases. Ground diagnostic instrumentation included an ionosonde, magnetometer, two photography stations, and HF phase-coherent sounders. Rocket-borne electron-density probes were flown on two of the shots in January 1975. The Kwajalein data were found to be consistent with the theory of barium cloud dynamics. The theory is thereby considered to be generally validated, in that it pertained through a significant change in boundary conditions and independent variables. Dissert. Abstr.

N77-13583 Utah State Univ., Logan.
ALBEDO OF THE EARTH'S SURFACE: A COMPARISON OF MEASUREMENTS TAKEN ON THE GROUND AND FROM FLYING PLATFORMS Ph.D. Thesis
Frank Delafield Eaton 1976 184 p
Avail: Univ. Microfilms Order No. 76-25603

The main objectives of the study were to develop the indicatrices of reflected solar radiation from different natural surfaces and to show comparisons between values sensed in space of emergent radiation to ground values obtained from accounting for anisotropic reflection and estimating the effect of the intervening atmosphere. Anisotropy of reflected radiation was found for all surfaces examined and increased with decreasing solar angle. Different surfaces showed different degrees and patterns of forward and backscatter. Comparisons were made between estimated emergent radiation from the top of the earth's atmosphere accounting for anisotropy of the ground reflection pattern and estimates of atmospheric attenuation to values of reflected radiation obtained from the MSS subsystem of the ERTS program for the lava beds region and White Sands area in New Mexico. Also, comparisons were shown between the estimated emergent radiation from the earth's surface for the same features and spectral bands to the values sensed in space. Dissert. Abstr.

N77-13584 Stanford Univ., Calif.
THE RESPONSE OF THE IONOSPHERE TO THE INJECTION OF CHEMICALLY REACTIVE VAPORS Ph.D. Thesis
Paul Alan Bernhardt 1976 262 p
Avail: Univ. Microfilms Order No. 76-25974

Flights of space vehicles, such as the space shuttle, into the ionosphere may permit the controlled depletion of the F2-layer by the injection of selected gases. Estimation of the optimum modification experiment is based on calculations of temporal and spatial characteristics of the ionospheric hole for various types and amounts of injected gas. Criteria for judging candidate gases include the amount of ionospheric plasma depleted per unit mass of released gas, the chemical reaction rates, and the resistance to photodissociation during the day and to condensation during the night. Based on these criteria, H2 is recommended for gas release experiments. Water vapor and carbon dioxide are acceptable for daytime releases, but lose efficiency at night due to condensation. Dissert. Abstr.

N77-13585*# Ohio State Univ. Research Foundation, Columbus.
MONITORING OF CRUSTAL MOVEMENTS IN THE SAN ANDREAS FAULT ZONE BY A SATELLITE-BORNE RANGING SYSTEM Ph.D. Thesis
Muneendra Kumar Aug. 1976 157 p refs
(Grant NGR-36-008-204; OSURF Proj. 3820-A1)
(NASA-CR-149246; DGS-243) Avail: NTIS HC A08/MF A01 CSCL 08G

The Close Grid Geodynamic Measurement System is conceived as an orbiting ranging device with a ground base grid of reflectors or transponders (spacing 1.0 to 30 km), which are projected to be of low cost (maintenance free and unattended), and which will permit the saturation of a local area to obtain data useful to monitor crustal movements in the San Andreas fault zone. The system includes a station network of 75 stations covering an area between 36 deg N and 38 deg N latitudes, and 237 deg E and 239 deg E longitudes, with roughly half of the stations on either side of the faults. In addition, the simulation of crustal movements through the introduction of changes in the relative positions between grid stations, weather effect for intervisibility between satellite and station and loss of observations thereof, and comparative evaluation of various observational scheme-patterns have been critically studied. Author

N77-13586*# Aerophysics Research Corp., Bellevue, Wash.
APPLICATION OF TRAJECTORY OPTIMIZATION TECHNIQUES TO UPPER ATMOSPHERE SAMPLING FLIGHTS USING THE F-15 EAGLE AIRCRAFT
D. S. Hague and A. W. Merz Aug. 1976 92 p refs
(NASA Order A-29485-B)
(NASA-CR-137973) Avail: NTIS HC A05/MF A01 CSCL 04A

Atmospheric sampling has been carried out by flights using an available high-performance supersonic aircraft. Altitude potential of an off-the-shelf F-15 aircraft is examined. It is shown that the standard F-15 has a maximum altitude capability in excess of 100,000 feet for routine flight operation by NASA personnel. This altitude is well in excess of the minimum altitudes which must be achieved for monitoring the possible growth of suspected aerosol contaminants. Author

N77-13587*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC ANOMALY MAP OF NORTH AMERICA SOUTH OF 50 DEGREES NORTH FROM POGO DATA
M. A. Mayhew Aug. 1976 22 p refs Presented at 2d Intern. Conf. on the New Basement Tectonics, Univ. of Delaware, Jul. 1976
(NASA-TM-X-71229; X-922-76-201) Avail: NTIS HC A02/MF A01 CSCL 08E

A magnetic anomaly map produced from Pogo data for North America and adjacent ocean areas is presented. At satellite elevations anomalies have wavelengths measured in hundreds of kilometers, and reflect regional structures on a large scale. Prominent features of the map are: (1) a large east-west high through the mid-continent, breached at the Mississippi Embayment; (2) a broad low over the Gulf of Mexico; (3) a strong gradient separating these features, which follows the Southern Appalachian-Ouachita curvature; and (4) a high over the Antilles-Bahamas Platform which extends to northern Florida. A possible relationship between the high of the mid-continent and the 38th parallel lineament is noted. Author

N77-13588*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
ZONAL AVERAGE EARTH RADIATION BUDGET MEASUREMENTS FROM SATELLITES FOR CLIMATE STUDIES
James S. Ellis and Thomas H. Vonder Haar Jan. 1976 63 p refs
(Grant NGR-06-002-102)
(NASA-CR-149319; Atmospheric-Science-Paper-240; US-ISSN-0067-0340) Avail: NTIS HC A04/MF A01 CSCL 04A

Data from 29 months of satellite radiation budget measurements, taken intermittently over the period 1964 through 1971, are composited into mean month, season and annual zonally averaged meridional profiles. Individual months, which comprise the 29 month set, were selected as representing the best available total flux data for compositing into large scale statistics for climate studies. A discussion of spatial resolution of the measurements along with an error analysis, including both the uncertainty and standard error of the mean, are presented. Author

N77-13589*# Transemantics, Inc., Washington, D.C.
RELATIONSHIP OF INTERPRETIVE CRITERIA OF PLUTONIC FRACTURES TO THE CHARACTER OF THE NEWEST MOVEMENTS (KAZAKHSTAN AND CENTRAL ASIA AS EXAMPLES)
N. V. Skublova NASA Mar. 1976 16 p refs Transl. into ENGLISH of "O Zavisimosti Deshifrovochnykh Priznakov Glubinnykh Razlomov ot Kharaktera Noveyshikh Dvizheniy (na Primere Kazakhstana i Sredney Azii)" Moscow, 1975 12 p
(Contract NASw-2792)
(NASA-TT-F-16937) Avail: NTIS HC A02/MF A01 CSCL 08G

Analysis of the recent tectonics of individual regions on the basis of satellite photographs makes it possible to establish the role of discontinuous fractures in the formation of very large recent structures, and to classify the lineaments which were identified into discontinuous fractures of four types. The boundary orogenic planetary faults may be viewed as the antipodes of the deep faults of the rift valleys of the oceans. The differences consist in the fact that the deep faults of the rift valleys determine the separation zones, and the boundary orogenic faults determine the compression and thrust zones. Author

N77-13590*# Scientific Translation Service, Santa Barbara, Calif.
CROSS STRUCTURAL PLAN OF THE EARTH'S CRUST AND THE PROBLEM OF THE MANIFESTATION OF ITS PLUTONIC ELEMENTS ON THE SURFACE (TYAN-SHAN AND TURAN PLATE AS EXAMPLES)
V. I. Makarov and L. I. Solovyeva Washington NASA Apr. 1976 44 p refs Transl. into ENGLISH of the book "Perekrestnyy strukturnyy plan zemnoy kory i problema proyavleniya ego glubinnykh elementov no poverkhnosti (na primere Tyan-Shanya i turanskoy plity)" Moscow, Acad. Sci. USSR, 1975 p 1-50
(Contract NASw-2791)
(NASA-TT-F-16938) Avail: NTIS HC A03/MF A01 CSCL 08G

The plutonic structures of the earth's crust based on an analysis of its surface with the aid of orbital photographs are studied. It is found that space photography is very valuable in studying the substructure of the earth's crust. The possibility of distinguishing genetically diverse components of the geochemical spectrum of the earth's surface may have far-reaching consequences in fossil fuel exploration. Author

N77-13591*# Scientific Translation Service, Santa Barbara, Calif.
COMPARISON OF SEISMICITY WITH THE INTERPRETATION ELEMENTS OF SPACE IMAGES
I. V. Anan'in and V. G. Trifonov Washington NASA Mar. 1976 15 p refs Transl. into ENGLISH of the report "Sopostavleniye seysmichnosti s elementami deshifrirovaniya kosmicheskikh izobrazheniy" Moscow, Acad. of Sciences USSR, 1975 p 1-10
(Contract NASw-2791)
(NASA-TT-F-16945) Avail: NTIS HC A02/MF A01 CSCL 08K

A comparison is made of seismicity with identification elements of space photographs of differing scale. The Eastern Caucasus was used for the study. Space photographs were used which corresponded to two degrees of generalization. Author

N77-13592*# Scientific Translation Service, Santa Barbara, Calif.
ESTIMATIONS OF THE CHARACTERISTICS OF THE ATMOSPHERIC CIRCULATION ON ROTATING PLANETS
S. S. Zilitinkevich Washington NASA Dec. 1976 10 p refs Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow), v. 228, no. 1, 1976 p 62-65
(Contract NASw-2791)
(NASA-TT-F-17509) Avail: NTIS HC A02/MF A01 CSCL 04A

A numerical model is presented which describes a rotating planet with quasigeostrophic atmospheric circulation of a zonal type which is produced by the difference in heat at the upper and lower latitudes. The model is then applied to the planet Mars. The problem of baroclinic instability is also considered. D.M.L.

N77-13593# Academy of Sciences (USSR), Moscow. Space Research Inst.
ALTITUDE CHANGES OF THE ELECTRICAL POTENTIAL OF THE ERIDAN ROCKET DURING ARAKS EXPERIMENT
K. I. Gringauz and N. M. Shutte 1976 26 p refs
(D-223) Avail: NTIS HC A03/MF A01

The results of electric potential Phi determined at different altitudes during the flight of the Eridan rocket on January 26, 1975, following the Araks experiment program are reported. A mechanism was found to insure the gathering of ionospheric electrons with the current over the total rocket surface of the order of the ampere. It occurred at altitudes lower than 125 km; with an altitude decrease the electric potential significantly reduces in spite of the number of electrons injected into the ionosphere. Using instruments for measurement of electric potential, electron fluxes with energy greater than e Phi were also observed. ESA

N77-13594# Kiruna Geophysical Inst. (Sweden).
KIRUNA GEOPHYSICAL DATA Data Summary, Oct.-Dec. 1975
G. Gustafsson, ed. Dec. 1975 53 p
(Rept-75/10-12) Avail: NTIS HC A04/MF A01

The data obtained from ground measurements relate to polar upper atmospheric conditions and include measurements of geomagnetism, optical aurora, ionospheric ionization, radio wave propagation, and cosmic radiation. ESA

N77-13595# European Space Agency, Paris (France).
GROUND-BASED MULTISPECTRAL PASSIVE MICROWAVE SOUNDING OF ATMOSPHERIC TEMPERATURE PROFILES NEAR 60 GHz
Friedrich Malota, Volker Stein et al Jul. 1976 57 p refs Transl. into ENGLISH of 'Theoretische Untersuch. multispektraler passiver Mikrowellensondierungen atmosphaerischer Temperaturprofile bei 60 GHz vom Erdboden aus', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-FB-76-01, 1976 Original German report available from DFVLR, Cologne DM 22.80
(ESA-TT-304; DLR-FB-76-01) Avail: NTIS HC A04/MF A01

The relation between atmospheric parameters and thermal microwave radiation, expressed by noise temperature, was derived for measurements made from ground level. The influence on the noise temperatures of various atmospheric conditions (cold, medium, and hot atmosphere), cloud formations, and temperature inversion layers near the ground was investigated. The problem of the reconstruction of vertical temperature profiles from measured values of the noise temperatures is demonstrated by means of examples of computer calculations. Author (ESA)

N77-13596# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
DETERMINATION OF THE IONOSPHERIC ELECTRON DENSITY DISTRIBUTION FROM TIME DELAY MEASUREMENTS OF VHF-SATELLITE TRACKING SIGNALS
Volker Stein 10 Jun. 1976 46 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-346)
(DLR-FB-76-33) Avail: NTIS HC A03/MF A01; DFVLR, Cologne, DM 19.60

The electron density distribution in the ionosphere is determined from computer simulated time delay data of a satellite signal with varying elevation angles at very high frequencies. The electron density is derived for two essential measurement situations. In the first case, where the position of the satellite is known with sufficient accuracy, the computation of the ionospheric parameters is achieved independently from the orbit determination procedure. For the case in which the position of the satellite has to be computed from measurements a coupling between the procedures of orbit and ionospheric parameter determination becomes necessary. The principle of this method is demonstrated by various test examples. In both cases the accuracy of the results in the ionospheric parameters is put in relation to the measurement accuracy. Author (ESA)

N77-13597# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
INFRARED CONTINUUM ABSORPTION BY ATMOSPHERIC WATER VAPOR IN THE 8.12-MICROMETER WINDOW Final Report, Oct. 1975 - Mar. 1976
Robert P. Roberts, Lucien M. Biberman, and John E. A. Selby Apr. 1976 29 p refs
(AD-A025377; P-1184; IDA/HQ-76-18059) Avail: NTIS HC A03/MF A01 CSCL 17/5

We have carried out a detailed analysis of several long-path-length transmission measurements in the 8 to 12 micrometer atmospheric window in order to determine the extinction coefficient due to the water vapor continuum. Our results indicate that three modifications to the current LOWTRAN atmospheric transmission model are required. The first two corrections are an improved fit to the pure water vapor continuum absorption coefficient and the elimination of the atmospheric broadened continuum term. Finally, and most critically, a strong measured temperature dependence must be included in the water vapor continuum absorption coefficient. For path lengths ranging from 10 to 50 km, failure to incorporate these corrections can lead to errors in the computed transmission ranging from factors of 2 to more than 10,000. Author (GRA)

N77-13598# Defense Communications Agency, Arlington, Va.
A STATISTICAL MODEL OF THE LOWER IONOSPHERE
Jan. 1976 66 p refs
(AD-A025887; DCA-C600-TP-76-2) Avail: NTIS HC A04/MF A01 CSCL 04/1

This report analyzes, as a group, measurements of the electron density profile in the lower ionosphere. Approximately 15 years of measurements were analyzed and an effort is made to develop a preliminary time-varying ionospheric model for use in determining VLF and LF propagation predictions. GRA

N77-13599# Terra Tek, Inc., Salt Lake City, Utah.
MEASUREMENT AND ANALYSIS OF PORE PRESSURE EFFECTS IN THE INELASTIC DEFORMATION OF ROCKS Topical Report, Apr. 1974 - Aug. 1975
J. N. Johnson and R. K. Dropek Oct. 1975 65 p refs
(Contract DNA001-75-C-0102; DNA Proj. NWED-QAXSB047)
(AD-A025140; DNA-3839T; TR-75-29) Avail: NTIS HC A04/MF A01 CSCL 08/7

Cyclic experimental tests on water-saturated rock samples exhibit effects which are unexplainable in terms of the usual constitutive models for rock. A formal theory of plasticity based on the law of effective stress and the associated flow rule is developed in detail and applied to the specific cases of a linear Mohr-Coulomb failure envelope and a cap of the type used to describe the behavior of McCormic Ranch sand. It is found that both models have serious disadvantages when applied to fluid-saturated rocks under conditions of nonzero pore pressure. Experimental techniques are described for measurement of pore pressure under undrained test conditions. Results of undrained laboratory tests are presented in which pore pressure is measured as a function of the externally applied mean stress, deviatoric stress and volumetric strain in sandstone samples saturated to levels of 80%, 85%, 90% and 95%. GRA

N77-13600# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.

A HISTORICAL SUMMARY OF EARTHQUAKE EPICENTERS IN AND NEAR ALASKA
Herbert Meyers Apr. 1976 82 p refs
(PB-257258/4; NOAA-TM-EDS-NGSDC-1; NOAA-76060108)
Avail: NTIS HC A05/MF A01 CSCL 08K

The Alaska earthquake data file as presently developed by the National Geophysical and Solar-Terrestrial Data Center (NGSDC) is summarized. This is a growing file, and additional data are being added both for current and historical earthquakes as they are prepared for machine processing. It describes data formats, sources used in developing the data file, and data limitations. Included are several tables which summarize the data in usable forms. The publication also is designed to accompany magnetic tapes, microfilm, and printouts produced from the data file. GRA

N77-13601# Lamont-Doherty Geological Observatory, Palisades, N.Y.
GRAVITY, MAGNETICS, AND SEISMICITY
James R. Cochran and Manik Talwani May 1976 25 p refs Sponsored in part by NSF Prepared in cooperation with New York Sea Grant Inst., Albany
(Contract N00014-67-A-0108-0004; Grant NSF GA-27281) (PB-257266/7; LDGO-2200; NOAA-76061402; Atlas-Mono-9)
Avail: NTIS HC A02/MF A01 CSCL 08G

Free air gravity and total-intensity magnetic anomalies in the New York Bight region, presented as profiles along ships' tracks, are dominated by prominent positive and negative bands. Those on the outer edge of the continental shelf and on the continental slope are associated with the transition from the North American continent to the Atlantic Ocean. Those on the inner shelf are associated with structures inherited from the region's geology prior to the formation of the present Atlantic Ocean. Although the Bight region is not particularly active seismically, numerous small to moderate earthquakes have occurred. The cause of the seismic activity is not well understood. GRA

N77-13602# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
WASTEWATER TREATMENTS IN COLD CLIMATES
Robert S. Sletten and Ants Uiga 1976 15 p refs
(AD-A026156) Avail: NTIS HC A02/MF A01 CSCL 13/2

Wastewater treatment at remote military installations in Alaska presently consists of aerated lagoons and extended aeration package plants. Although performance data for these systems are either very limited or in most cases nonexistent, indications are that most of these systems can not meet secondary effluent criteria as defined by the EPA. Processes for upgrading to meet the new criteria must be as simple as possible to design, build and operate. In particular, the requirements for operation and maintenance should be minimal due to the remote, isolated nature of most of the camps. Processes which appear to be feasible include land application, intermittent filtration, and variations of ponding. GRA

N77-13603# Hawaii Inst. of Geophysics, Honolulu.
AN ANALYSIS OF FACTORS CONTROLLING GRAVITY AND ITS PREDICTION IN THE ATLANTIC OCEAN Final Report
George P. Woollard and Valerie M. Hanna Mar. 1976 221 p refs
(Contracts DMA700-74-C-0192; N00014-75-C-0209; NR Proj. 083-603)
(AD-A026850; HIG-76-4) Avail: NTIS HC A10/MF A01 CSCL 08/5

This report is presented in the format of a logical mode of investigation having general applicability in establishing a gravity prediction process for any oceanic area but applied specifically to the Atlantic Ocean. The presentation takes cognizance of the fact that there are gravity domains in which the basic relationship between gravity anomalies and regional changes in bathymetry varies; that plate tectonics plays a significant role in defining the boundaries of gravity domains; that long wavelength changes and lithospheric mass play a significant role in defining the rate and sign of change in free air anomaly values with change in water depth within a given gravity domain; and that changes in crustal age and crustal thickness and composition give rise to both local and semi-regional perturbations which, for the most part, can not be anticipated except where there is associated bathymetric expression or some geophysical parameter value related to gravity. GRA

N77-13249# European Space Research and Technology Center, Noordwijk (Netherlands).
RESULTS OF 30 MONTHS RUNNING OF THE ESRO RADIOMETER EXPERIMENT
F. M. Galante *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 103-111 refs (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N77-13604 National Lending Library for Science and Technology, Boston Spa (England).
SOLID-STATE ELECTROMETER FOR MEASURING THE ELECTRIC POTENTIAL OF THE AIR AT 1 METRE ABOVE THE EARTH'S SURFACE
H. Malcorps, H. VandeVelde, and M. DeMaesschalck [1975] 19 p Transl. into ENGLISH of Brussels Inst. R. Met., Belgique, publ. ser. B. no. 79, 1975
(NLL-M-24209-(5828.4F)) Avail: Natl. Library Lending Div., Boston Spa, Engl.

A solid-state electrometer with guarding and a range of -500 V to +500 V was developed. The measuring system was linear and regular calibration was unnecessary. The instrument was hardly affected by aging. In practice the bandwidth of the instrument was limited by the impedance of the antenna and its connecting cable. The introduction of guarding makes for increased input impedance and bandwidth. The effect of bins current, offset voltage and limited common-mode rejection of the input amplifier on the operation of the electrometer was studied. The bias current has to be small, and in addition the offset voltage needs to be less than 100 microvolts. Finally a description was given of the actual production of an electrometer together with a circuit to protect the instrument against overvoltage and a measuring circuit enabling positive and negative signals to be recorded on different channels. Author

N77-13605 Pennsylvania Univ., Philadelphia.
THE INITIAL GROWTH OF DATA-RELATED ERRORS IN MESOSCALE NUMERICAL WEATHER PREDICTION MODELS Ph.D. Thesis
Thomas Tomkins Warner 1976 114 p
Avail: Univ. Microfilms Order No. 76-24810

A set of stochastic-dynamic equations was utilized to investigate the error-energy transfer that occurs during the initial adjustment phase of numerical models. The results were interpreted in terms of mesoscale data accuracy requirements, the general mesoscale predictability problem, and the use of various initialization techniques. Dissert. Abstr.

N77-13606 Stanford Univ., Calif.
RAINFALL SYNTHESIS WITH SCANTY DATA Ph.D. Thesis
Eduardo Antonio Varas-Castellon 1976 146 p
Avail: Univ. Microfilms Order No. 76-26087

This research formulates a mathematical model of rainfall for seasonal and storm periods for large region in Central California, and establishes relationships to estimate model parameters when historical records are scarce. Synthesis of hydrological data provides the designer and the planner with a sequence of events likely to occur in the future, and allows the analysis of water resource structures under different hydrologic inputs; thus it gives a probabilistic forecast of system behavior. Seasonal rainfall is stimulated by a linear model which maintains means, variances and serial correlations at each location and cross correlations between stations. Estimating relationships for the parameters in terms of usually available geographic and topographic indices were derived for each season. Results show that

average and standard deviation of seasonal rainfall can be predicted accurately employing longitude, elevation, slope of air streamlines and barrier height at each point. Dissert. Abstr.

N77-13607 Washington Univ., Seattle.
A THEORETICAL STUDY OF THE EVOLUTION OF MIXED PHASE CUMULUS CLOUDS Ph.D. Thesis
Bryan Cosby Scott 1976 281 p
Avail: Univ. Microfilms Order No. 76-25454

A sophisticated warm and cold cloud microphysical description was incorporated in a one-dimensional, time-dependent, Eulerian cumulus cloud model. The relationship of the ice phase to the development of the precipitation process was studied, and the interactions between cloud microphysics and cloud dynamics were examined. Five separate ice particle categories were allowed to interact among themselves and with water droplets to produce graupel, unrimed and rimed ice crystals and snowflakes. The ice crystals include plates, columns, and dendrites. Cloud drops formed on specified numbers of aerosol particles defined in terms of their salt content or supersaturation spectra. The ice splintering studies demonstrated the sensitivity of the ice multiplication process to the presence of large cloud drops. Comparative studies with shallow, non-precipitating maritime and continental cumulus clouds demonstrated the importance of the drop size distribution in determining the dominant mechanism for forming graupel. In both cases, the artificial seeding accelerated the arrival of large graupel at the bases of the clouds; this was particularly evident in the continental cloud where essentially no graupel formed in the absence of seeding. Dissert. Abstr.

N77-13608 National Lending Library for Science and Technology, Boston Spa (England).
AIR PRESSURE ABOVE THE ATLANTIC APPROACHES TO THE ARCTIC SECTOR, AND THE DISCHARGE OF THE NORDKAPP CURRENT
V. N. Moretskiy and S. I. Stepanov [1976] 5 p Transl. into ENGLISH from Tr. Arkticheskogo i Antarkt. Nauchn.-Issled. Inst. (Leningrad), v. 325, 1974 p 92-95 In ENGLISH and RUSSIAN
(NLL-M-24211-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Monthly discharges of the Nordkapp Current from 1945 to 1968 are presented in tables. A dynamic method is given for correlating these data with parameters of the air pressure fields in the Arctic adjacent to the Atlantic for determining a functional relationship. The reliability of discharges computed with the given equation is 78%. A.H.

N77-13609 National Lending Library for Science and Technology, Boston Spa (England).
QUANTITATIVE ESTIMATION OF THE INTENSITY OF CYCLONIC AND ANTICYCLONIC ACTIVITY IN THE NORTH ATLANTIC
K. V. Kondratovich and S. I. Savchenko [1976] 11 p refs Transl. into ENGLISH from Tr. Arkticheskogo i Antarkt. Nauchn.-Issled. Inst. (Leningrad), v. 325, 1974 p 43-52 In ENGLISH and RUSSIAN
(NLL-M-24210-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Daily weather maps for the northern hemisphere over a sixty year period were used to construct composite monthly maps of pressure formations. The number of pressure formations of different intensity was computed for six regions of the North Atlantic. The intensity of atmospheric circulation at sea level for each region is presented in tables. A.H.

N77-13610 British Library Lending Div., Boston Spa (England).
COEFFICIENTS FOR THE INCREASE IN WIND SPEED WITH HEIGHT IN THE ATMOSPHERIC BOUNDARY LAYER, FROM EXPERIMENTAL DATA
O. B. Shkylarevich [1976] 17 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), v. 326, 1975 p 122-129 In ENGLISH and RUSSIAN
(BLL-M-24208-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The rapid development of high-rise building, aviation and rocket technology requires knowledge of how wind speed varies with height in the lowest layer of the atmosphere. Study of the wind profile and the coefficients for increase in wind speed with height in the atmospheric boundary layer is conducted both theoretically and experimentally. An analysis is presented of changes in the wind with height in the lowest layer in relation to the determining parameters: the speed of the geostrophic wind, height, roughness of the underlying surface, the Coriolis parameter, and the nature of the stratification. Author

N77-13611 Arkansas Univ., Fayetteville.
NATURAL AND ARTIFICIALLY-PRODUCED RADIONUCLIDES AS ATMOSPHERIC TRACERS Ph.D. Thesis
Muralidharu Babu Gavini 1976 121 p
Avail: Univ. Microfilms Order No. 76-26406

The activities of 210Pb, 210Bi and 210Po were measured in 17 rain samples which were collected at Fayetteville, Arkansas, during the months of April through June 1973, and 210Pb and 210Po only were measured in 108 additional rain samples collected during the period of September 1973 through April 1975. In approximately 70 percent of the cases, the residence time calculated from the 210Bi, 210Pb and 210Po, 210Pb ratios were either concordant or near concordant. The discordant residence times in 30 percent of the cases can be shown to result from the mixing of two different air masses: one represented by a short and the other by a much longer residence time of the radon daughters. In order to test this idea, the radionuclides 210Pb and 210Po were sequentially sampled from three rainstorms. Dissert. Abstr.

N77-13612 Oklahoma Univ., Norman.
MULTIVARIATE EXPERIMENTAL DESIGN IN METEOROLOGY Ph.D. Thesis
Patrick James Brady 1976 139 p
Avail: Univ. Microfilms Order No. 76-24359

An objective technique, which permits the analysis and investigation of multivariate as well as univariate data sets, is discussed. The applicability of this technique is demonstrated using a multivariate data set comprised of surface and radar precipitation measurements. Derived spatial-temporal correlation and cross-correlation functions are presented: univariate and multivariate analyses of the observation set are compared: and the relative worth of different Z-R (radar reflectivity rainfall) relationships is explored. The combining of this analysis technique with a nonlinear programming (NLP) algorithm for use as an experimental design tool is also discussed. Optimal spatial station configurations are presented and trade-offs between different sensor types are explored. Dissert. Abstr.

N77-13613*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE-OBSERVED LATENT HEAT RELEASE IN A TROPICAL CYCLONE
Robert F. Adler and Edward B. Rodgers Nov. 1976 30 p refs
(NASA-TM-X-71227; X-911-76-151) Avail: NTIS HC A03/MF A01 CSCL 04B

Data from the Nimbus 5 electrically scanning microwave radiometer (ESMR) are used to make calculations of the latent heat release (L.H.R.) and the distribution of rainfall rate in a tropical cyclone as it grows from a tropical disturbance to a typhoon. The L.H.R. (calculated over a circular area of 4 deg latitude radius) increases during the development and intensification of the storm from a magnitude of 2.7 X 10 to the 21st power ergs/s (in the disturbance stage) to 8.8 X 10 to the 21st power ergs (typhoon stage). The latter value corresponds to a mean rainfall rate of 2.0 mm hr/s. The more intense the cyclone and the greater the L.H.R., the greater the percentage contribution of the larger rainfall rates to the L.H.R. In the disturbance stage the percentage contribution of rainfall rates less than or minus 6 mm hr/s is typically 8%; for the typhoon stage, the value is 38%. The distribution of rainfall rate as a function of radial distance from the center indicates that as the cyclone intensifies, the higher rainfall rates tend to concentrate toward the center of the circulation. Author

N77-13614# Centre National de la Recherche Scientifique, Paris (France). Lab. de Meteorologie Dynamique.
LOW-LEVEL AIR FLOW CIRCULATION OVER THE ARABIAN SEA DURING THE SUMMER MONSOON AS DEDUCED

FROM SATELLITE-TRACKED SUPERPRESSURE BALLOONS. PART 1: BALLOON TRAJECTORIES
Daniel Cadet and Henri Ovarlez Jan. 1976 28 p refs Submitted for publication Sponsored in part by Delegation Gen. a la Rech. Sci. et Tech. (DGRST) and CNES
Avail: NTIS HC A03/MF A01

Circulation was determined by an analysis of trajectories of superpressure constant level balloons tracked by Nimbus 6. A technical description of the experiment is given followed by an analysis of the observed balloon trajectories. Results indicate that low level ballooning to map air currents over unsurveyed oceans shows promise. ESA

N77-13615# World Meteorological Organization, Geneva (Switzerland).
REPORT OF THE EIGHTH SESSION OF THE TROPICAL EXPERIMENT BOARD Global Atmospheric Research Programme
1976 85 p refs Conf. held at Geneva, 4-6 May 1976 Prepared jointly with ICSU, Rome
(GARP-Spec-Rept-20) Avail: NTIS HC A05/MF A01; WMO, Geneva

The session was concerned with the activities relating to the processing of GATE data and the research phase of the experiment. Recommendations were made to accommodate delays in the exchange of data which had occurred. Other actions included preparations for a synthesis of scientific results in late 1977-1978. Appendices list international assessments of NPC data processing and SDC data input as well as national reports on scientific analysis. ESA

N77-13616# Royal Netherlands Meteorological Inst., De Bilt.
WEATHER FORECASTING FOR PERIODS LONGER THAN 3 DAYS, IN THE NETHERLANDS AND ELSEWHERE [WEERSVERWACHTINGEN VOOR PERIODEN VAN MEER DAN 3 DAGEN VOORUIT, ZOWEL IN NEDERLAND ALS DAARBUITEN]
A. P. M. Baede, H. J. Krijnen, J. Reiff, and J. L. Nap 1976 18 p refs In DUTCH
(KNMI-V-274) Avail: NTIS HC A02/MF A01

Methods, parameters, and results of weekly, monthly, and seasonal weather forecasting in the Netherlands and elsewhere are reviewed. Weekly forecasting methods in the Netherlands, Great Britain, Germany, and Finland are dealt with; monthly forecasts include the Netherlands, Great Britain (Bracknell), Germany (Offenbach and F. Baur), the U.S., and Belgium (J. F. Boomans and J. F. Poppe); and seasonal predictions involve Great Britain (Bracknell and H. H. Lamb) and Germany (Offenbach and F. Baur). The different methods were critically analyzed in order to verify whether the methods used in the Netherlands are optimal or not. ESA

N77-13617# Royal Netherlands Meteorological Inst., De Bilt.
ON THE DETERMINATION OF METEOROLOGICAL INSIGHT FOR MAXIMUM TEMPERATURE FORECASTING [OVER DE BEPALING VAN HET METEOROLOGISCH INZICHT BIJ DE VOORSPELLING VAN MAXIMUM TEMPERATUREN]
A. W. Hanssen 1976 9 p refs In DUTCH
(KNMI-V-275) Avail: NTIS HC A02/MF A01

The decrease of quality of long range weather forecasts as a function of the forecasting period was investigated for maximum temperature forecasting in the summer months. Persistence and anti-persistence forecasts of the daily maximum temperatures in June, July, and August over the period 1949-1970 were made, using the performance index as a measure for meteorological insight. ESA

N77-13618# Royal Netherlands Meteorological Inst., De Bilt.
REPORT ON WEATHER FORECASTING FOR THE BUILDING INDUSTRY DURING WINTER 1974 - 1975 [RAPPORT BETREFFENDE DE WEERBERICHTGEVING VOOR DE BOUWNIJVERHAID IN DE WINTER 1974-1975]
J. J. Allan, A. P. A. Kleintjes, and D. M. vanderWoude 1976 27 p In DUTCH
(KNMI-V-276) Avail: NTIS HC A02/MF A01

The special weather forecast procedures in the Netherlands are discussed. Details on measured temperature, precipitation, wind, and weather phases (ranges of average 24 hr temperatures) are given. Weather forecasts are compared with the actual outcome. Organization of the weather forecast procedure (by telephone) for the building industry is presented and an analysis of the use made of the service is given. ESA

N77-13619# Royal Netherlands Meteorological Inst., De Bilt.
HUMIDITY MEASUREMENTS AT A HEIGHT OF 200 M, APPLIED TO THE ESTIMATION OF THE PLUME LENGTHS OF COOLING TOWERS
H. R. A. Wessels 1976 33 p refs In DUTCH; ENGLISH summary
(KNMI-WR-76-8) Avail: NTIS HC A03/MF A01

Humidity measurements were carried out along the meteorological tower at Cabauw, Netherlands, using hair-hygrographs. The measurements at a height of 208 m were analyzed and compared with simultaneous measurements at the standard height of 1 1/2 m. Especially during the night the relative humidity was smaller with increasing height. On several occasions the relative humidity at the top of the tower dropped to values below 10 or 20 % in air subsiding above a low level inversion, whereas at the same time nothing particular happened near the ground. Simultaneous measurements of relative humidity and temperature were used to study the behavior of the absolute humidity at 208 and 1 1/2 m. The mixing ratio was highest near the surface level. The well-known daily variation with two maxima, present near the ground, almost disappeared at a height of 208 m. The tower measurements were used as input data in the model developed by Wessels and Wisse (1971) for the estimation of the length of cooling tower plumes. An interesting result is the preference of plumes to occur in the north-easterly direction. Author (ESA)

N77-13620# Royal Netherlands Meteorological Inst., De Bilt.
EVAPORATION FOG OVER THE RIVER AMER
H. R. A. Wessels 1976 22 p refs In DUTCH; ENGLISH summary
(KNMI-WR-76-10) Avail: NTIS HC A02/MF A01

In connection with a scheme to increase the cooling water discharge in the river Amer (Delta Region, the Netherlands) a theoretical study on the possibility of a more frequent occurrence of evaporation fog (steam fog, sea smoke) was made. The fog formation conditions by air masses mixing were studied for the case of cold air advection over warmer water. The model was completed by using visual observations of this type of fog; information on the degree of mixing in relation to the distance travelled over water was obtained. Meteorological data and water temperature measurements from nearby stations were used with the model to establish the climatological probability of evaporation fog. The relation between fog frequency and an artificial water temperature rise was estimated quantitatively. Some measuring campaign results of water surface isotherms were used to predict the relevant temperature rise of the Amer surface water. The cooling water mixing proved to be strongly dependent on the tide. At low tide the temperature rise has its maximum value. Author (ESA)

N77-13621# Chicago Univ., Ill. Dept. of the Geophysical Sciences.
A PROFILE OF AN EASTERLY WAVE FROM SMS PHOTOGRAPHS AND GATE SHIP REPORTS
Jaime J. Tecson and Ekundayo E. Balogun (Ife Univ., Nigeria) Oct. 1975 24 p refs
(Grants NSF DES-75-08119-A01; NOAA-04-4-158-1)
(PB-256395/5; RP-134; NOAA-76042113) Avail: NTIS HC A02/MF A01 CSCL 04B

By compositing time-latitude sections of infrared photographs from the Synchronous Meteorological Satellite and latitudinal cross sections of observations from several GATE ships and island stations lined meridionally along 23.5 deg W longitude during the period September 8 through 16, 1974, inclusive, a three-dimensional structure of a section of an easterly wave is presented. Observations covering one wave length of the wave train are analyzed for temperature and wind distribution from the surface to higher levels, including that on surface pressures. It is observed that the wave perturbation in the wind field is most prominent on the 700-mb surface. GRA

N77-13622# National Environmental Satellite Service, Washington, D.C.
THE USE OF THE RADIOSONDE IN DERIVING TEMPERATURE SOUNDINGS FROM THE NIMBUS AND NOAA SATELLITE DATA
Christopher M. Hayden Apr. 1976 26 p refs
(PB-256755/0; NOAA-TM-NESS-76; NOAA-76052501) Avail: NTIS HC A03/MF A01 CSCL 04B

Applications of the sounding instrument data of Nimbus 3, 4, and 5 and of the data from the vertical temperature profile radiometer on NOAA 2, 3, and 4 satellites are reviewed and examined. Methods used to tune the minimum information solution are investigated theoretically and applied to a common sample of real data for comparison. GRA

N77-13623# Army Electronics Command, Fort Monmouth, N.J.
APPLICATION OF METEOROLOGICAL SATELLITE DATA TO WEATHER SENSITIVE ARMY OPERATIONS
Bruce T. Miers and Steve Weaver May 1976 36 p refs
(DA Proj. 1T1-62111-AH-71)
(AD-A025857; ECOM-5594) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological satellite and ground-based data of a severe storm situation are used to study the relationships between satellite data and ground-based data and also to show how satellite data could be used for Army operations if surface data were nonexistent. This sequence of data showed that the -50 C cloud-top temperature contour derived from satellite data revealed the areas of the most intense thunderstorm cells. Radar reported thunderstorm tops were 1,000 to 1,500 meters higher than satellite reported cloud tops. The conclusion was that reasonable and useful weather information can be supplied currently to the battlefield commander by using only synchronous meteorological satellite data and state-of-the-art processing techniques when combined with the expertise of a meteorologist. Author (GRA)

N77-13624# Edgewood Arsenal, Aberdeen Proving Ground, Md.
INFLUENCE OF AEROSOL PROPERTIES ON THE ATTENUATION OF VISIBILITY BY ARTIFICIAL WATER FOGS Technical Report, Jan. - Jun. 1974
John S. Derr, Jr. May 1976 45 p refs
(DA Proj. 1T1-61102-A-71A)
(AD-A025363; EC-TR-76022) Avail: NTIS HC A03/MF A01 CSCL 04/2

A theoretical analysis of aerosol properties associated with attenuation of visibility by artificial water fog is presented, utilizing data from the open literature on aerosol diffusion properties as a function of meteorological stability conditions and data generated in house on the evaporation properties of fatty alcohol-stabilized water drops. Operational criteria are established and equations are developed permitting optimization of parameters to potentially attain a specified visibility screening capability. Droplet size distributions and concentration for both homogeneous and heterogeneous fogs are included in the analysis, as are meteorological stability factors, atmospheric relative humidity, fatty alcohol-stabilized water droplet evaporation coefficients, fog generation source strength, screen height, crosswind screening depth, and effective screening distance downwind. Recommendations for continued effort to further disclose the magnitude of the indicated practicable screening potential are made. Author (GRA)

N77-13242# Politecnico di Milano (Italy). Ist. di Elettronica.
SOME RAINFALL RATE STATISTICS FROM RADAR DATA
A. Pawlina *In* ESA Probl. of Space and Terrest. Microwave Propagation May 1976 p 25-31 ref (For primary document see N77-13238 04-31)
Avail: NTIS HC A13/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N77-13625*# Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.
A THREE-DIMENSIONAL, TIME-DEPENDENT MODEL OF MOBILE BAY Final Report
F. H. Pitts and R. C. Farmer Oct. 1976 444 p
(Contract NAS8-30380)
(NASA-CR-150110) Avail: NTIS HC A19/MF A01 CSCL 08J

A three-dimensional, time-variant mathematical model for momentum and mass transport in estuaries was developed and its solution implemented on a digital computer. The mathematical model is based on state and conservation equations applied to turbulent flow of a two-component, incompressible fluid having a free surface. Thus, bouyancy effects caused by density differences between the fresh and salt water, inertia from thare river and tidal currents, and differences in hydrostatic head are taken into account. The conservation equations, which are partial differential equations, are solved numerically by an explicit, one-step finite difference scheme and the solutions displayed numerically and graphically. To test the validity of the model, a specific estuary for which scaled model and experimental field data are available, Mobile Bay, was simulated. Comparisons of velocity, salinity and water level data show that the model is valid and a viable means of simulating the hydrodynamics and mass transport in non-idealized estuaries. Author

N77-13626# Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
THE INDEX OF REFRACTION OF SEAWATER Final Technical Report
Roswell W. Austin and George Halikas Jan. 1976 124 p refs
(Contract N66857-73-C-0146; ARPA Order 2431)
(AD-A024800; SIO-Ref-76-1) Avail: NTIS HC A06/MF A01 CSCL 08/10

A smoothly varying and internally self-consistent set of tables of the index of refraction of seawater with respect to air are presented. The dependence of the index on salinity, temperature (0 to 30 C), wavelength (400 to 700 nm) and pressure (0 to 1,100 kg/sq cm gage) has been fully covered. The relevant literature from prior to 1900 through the present has been extensively reviewed. Various comparisons between indices obtained from these sources and the tables presented have been performed suggesting an overall accuracy of the tabulated index values of about 0.00003 at atmospheric pressure and 0.0001 at higher pressures. The requirements necessary for obtaining salinity and specific gravity directly from measurements of the index of refraction, for oceanographic purposes, have been examined. GRA

N77-13627# Virginia Inst. of Marine Science, Gloucester Point.
DETAILED BATHYMETRY OF SELECTED AREAS OF THE INNER CONTINENTAL SHELF OF THE VIRGINIAN SEA: SOUTHEASTERN VIRGINIA, VIRGINIA BEACH, VIRGINIA; WACHAPREAGUE, VIRGINIA Special Report
Carolyn H. Sutton, Victor Goldsmith, and Asbury H. Sallenger 1976 28 p
(Grant NOAA-04-5-158-49)
(PB-257204/8; VIMS-SRAMSOE-69; NOAA-76061405) Avail: NTIS HC A03/MF A01 CSCL 08J

Bathymetric maps containing significantly more information than is commonly included in maps of this kind are presented. The data base grids employed were taken from a portion of the original Transverse Mercator Projection used in the development of the Virginia Sea Wave Climate Model. The areas of the base map selected for compiling the depths used in the second order grids were photographed from the original scribe coat negative and enlarged two times. The third order Virginia Beach Grid was photographed using the same procedure. GRA

N77-13628# National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
SEASONAL SURFACE CURRENTS OFF THE COASTS OF VANCOUVER ISLAND AND WASHINGTON AS SHOWN BY DRIFT BOTTLE EXPERIMENTS
W. James Ingraham, Jr. and James R. Hastings May 1976 16 p refs
(PB-257249/3; NOAA-TR-NMFS-SSRF-699;
NOAA-76060306) Avail: NTIS HC A02/MF A01 CSCL 08C

Release of a total of 1,044 drift bottles during four periods

from April 1964 to January 1965 off the coasts of Washington and Vancouver Island, British Columbia, indicate a seasonal reversal of flow, southward in April and July and northward in November and January, within 200 km (108 nautical miles) of the coast. This study supplements those conducted off the Oregon and California coasts by other agencies. GRA

N77-13629# Naval Postgraduate School, Monterey, Calif.
THE INFLUENCE OF ENERGETIC MESOSCALE EDDIES ON THE OCEAN THERMAL STRUCTURE M.S. Thesis
Willine Elizabeth Christensen Mar. 1976 54 p refs
(AD-A026461) Avail: NTIS HC A04/MF A01 CSCL 08/10

The influence of internal heating by mesoscale eddies on the oceanic temperature structure is tested by including a vertical heat transport term, w:T:, in the ocean thermal budget equation. In the past studies of the thermocline problem, the heat transport term has been neglected. Analytical and numerical test cases were run solving the heat equation with and without the mesoscale eddy transport term for baroclinic and barotropic conditions in the ocean. Whenever heating by mesoscale eddies was included in the heat equation, excessive cooling occurred in the upper 1000 m of the ocean. The results of the test cases indicate that the eddies do have a distinct influence on the ocean's thermal structure and need to be included in solutions to the heat equation for the ocean. GRA

N77-13630# Hydronautics, Inc., Laurel, Md.
A LABORATORY STUDY OF WIND-WAVE-CURRENT INTERACTION, PART 2
Richard S. Scotti, Garry W. Elliott, and Mark S. Rice Jun. 1976 90 p refs
(Contract N00014-76-C-0593; ARPA Order 1910; NR Proj. 062-472)
(AD-A027467; TR-7619-1-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 08/3

This report studies the effect of wind and a spatially varying subsurface current field on both the wind-induced drift layer and the surface-wave spectrum. Steady state wind-wave-current interactions were established over a region of uniform current gradients which simulated an internal-wave-fixed measuring system. Wave-height spectra were recorded while wave-slope spectra were simultaneously made. GRA

N77-13631# Texas A&M Univ., College Station. Dept. of Oceanography.
RESPONSE OF A TWO-LAYER OCEAN WITH A BAROCLINIC CURRENT TO A MOVING STORM. PART 3: BAROTROPIC AND BAROCLINIC MODES
Takashi Ichiye and Michael Carnes May 1976 114 p refs
(Contract N00014-75-C-0537; Grant NSF OCE-70-00312; NR Proj. 083-036)
(AD-A027423; TAMU-Ref-76-3-T-Pt-3) Avail: NTIS HC A06/MF A01 CSCL 08/3

The normal mode equations for a two-layer ocean without current are scaled with characteristic distance, wind stress and time (or moving speed). When there is a geostrophic current in the upper layer, the normal mode separation is not possible, but equations for the barotropic transports include effects of the stationary current forcing terms as perturbation terms and the storm induced baroclinic transports as forcing functions. For a typical typhoon moving over the Kuroshio, the effects of the currents and the baroclinic transport become negligible for the barotropic transports which are determined by an iteration method. When the moving speed is less or more than about 5 m/sec, slow-moving or fast-moving approximation can be used. In the 1st case the interface shows almost uniform upwelling in a wake of the storm, and this is intensified slightly by the barotropic transports, particularly when the storm moves over the maximum current axis. In the 2nd case the interface shows undulated upwelling and effects of the barotropic transports become less than in the 1st case. GRA

N77-13632# Denver Research Inst., Colo. Mathematical Sciences Div.
INTERNAL GRAVITY WAVE PROPAGATION THROUGH A SHARP THERMOCLINE
Edmond L. Adams Mar. 1976 108 p refs
(Contracts NRO41-434/6-15-73; NRO41-434/6-10-75; NR Proj. 041-434)
(AD-A026907; MS-R-7614) Avail: NTIS HC A06/MF A01 CSCL 08/3

This paper is concerned with the investigation of internal gravity wave propagation in a deep ocean where the waves are produced by a moving source. This is all in the presence of a sharp thermocline (a region over which there is a rapid change in temperature). The model studied is described by a linearization of the fluid equations brought about by assuming that the internal waves are small amplitude perturbations on a prescribed inviscid incompressible ambient state. The thermocline is modeled by an interface problem where a jump discontinuity exists in an otherwise constant Brunt-Vaisala frequency (which is a measure of the natural frequency of fluid oscillations under the restoring effects of gravity). An exact integral representation is obtained for the solution via Fourier transforms and elimination. Integrals representing incident, reflected and transmitted waves are then approximated using multi-dimensional stationary phase and steepest descent. The phenomena of transition radiation along with lateral wave propagation from the interface back to the region of disturbance are also studied. We find transition radiation but no lateral wave. Machinery is brought to bear on two particular examples, a source moving with a vertical trajectory and an oscillating stationary source. For this later source we offer a new interpretation of some experimental results. Author (GRA)

N77-13633# Texas A&M Univ., College Station. Dept. of Physics.
THE SUNLIGHT GLITTER PATTERN
Gilbert N. Plass, George W. Kattawar, and John A. Guinn, Jr. 2 Jun. 1976 43 p refs
(Contract N00014-75-C-0537; NR Proj. 083-036)
(AD-A026225; TR-10) Avail: NTIS HC A03/MF A01 CSCL 08/3

Time-averaged intensities are computed for the glitter pattern of sunlight on a wind-ruffled sea. Isopleths are drawn from these on graphs which simulate glitter-pattern photographs through projections of sea-surface grid points on an inclined plane assumed to be in front of the observer. The intensity computed for each grid point is based on a calculation of the wave-surface orientation required for direct reflection from source to observer at that point; the probability of occurrence of this orientation, determined from the Cox-Munk distribution, is the principal factor in the computed intensity. The curvature of the earth is taken into account, and calculations are made for various cases of source elevation angle, observer altitude, and wind speed (the controlling parameter for the distribution of wave inclinations). Percent polarization is computed for the glitter patterns, and projected isopleths of this quantity are plotted. The effects of variations in wind speed, source elevation angle, and observer height on the morphology of the glitter pattern are shown, and such phenomena as the shifting of a reflected image toward the horizon are clearly demonstrated. It is suggested that the technique developed here could be useful in evaluating models of ocean wave structure and in making remote determinations of the sea state in the region of the glitter pattern. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N77-13634 Texas Univ., Austin.
STUDIES OF THE ISOTOPE CHEMISTRY OF MOLECULAR OXYGEN IN BIOLOGICAL SYSTEMS Ph.D. Thesis
Wooi-Lih Jeng 1976 80 p
Avail: Univ. Microfilms Order No. 76-26643

Dissolved oxygen and its del O-18 value show striking correlations in depth profiles of the open Gulf of Mexico and shallow marine bays. Diurnal variation of dissolved oxygen and its del O-18 value in the marine ecosystem of Redfish Bay is clearly observed and strongly correlated. Isotope effects in biological processes, photosynthesis and respiration, were investigated to explain the fractionation of dissolved stable oxygen isotopes in the marine environment. The relationship observed between dissolved oxygen and its del O-18 value in the depth

profile and diurnal variation is a biological effect. The equilibrium isotope effect in the reaction, oxygen in equilibrium with oxyhemoglobin, which relates to the process of respiration, was studied. The enrichment of stable oxygen isotopes due to respiration is not purely a kinetic isotope effect. The inorganic oxidation of ferrous ion enriches the O-18 of the oxygen pool.
Dissert. Abstr.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N77-13635 Dartmouth Coll., Hanover, N.H.
COMPUTER BASED ELECTRON BEAM TREATMENT PLANNING Ph.D. Thesis
Joseph Yen Ting 1976 305 p
Avail: Univ. Microfilms Order No. 76-24970

The development of a computer based system for electron beam treatment planning in radiation therapy is discussed. Two major projects were completed to obtain the patient and machine information required: (1) a hardware-software project to obtain tissue density of internal structures of patients; and (2) a detailed study of the radiation characteristics of the BBC-45 MeV. An electronic device was designed and built to accept transmission intensity data from patients examined with a dual probe scanner and to transmit this data to a large time sharing computer nearby.
Dissert. Abstr.

N77-13636 Iowa Univ., Iowa City.
A STUDY OF THE MECHANISM OF THE ALTERATION OF CARBON MONOXIDE-INDUCED LETHALITY Ph.D. Thesis
Joseph Marcus Winston 1976 115 p
Avail: Univ. Microfilms Order No. 76-26351

The hypothesis that there are non-carboxyhemoglobin related actions of carbon monoxide which contribute to its lethality was investigated. Possible clinically significant interactions between carbon monoxide and drugs were also studied. An experimental design was developed which included determining the effect of various pretreatments, including drugs and acute pre-exposure to carbon monoxide or hypoxic hypoxia, on carbon monoxide and hypoxic hypoxia lethality. If the lethal mechanism of carbon monoxide and hypoxic hypoxia are the same, it was felt that pretreatments should alter lethality in a similar manner. Differing alternations of lethality by pretreatments would be evidence for different lethal mechanisms of carbon monoxide and hypoxic hypoxia.
Dissert. Abstr.

N77-13637 Wayne State Univ., Detroit, Mich.
CRITICAL BANDWIDTH OF THE LOUDNESS DISCOMFORT LEVEL AND THE ACOUSTIC REFLEX Ph.D. Thesis
Larry Allen Frazier 1976 106 p
Avail: Univ. Microfilms Order No. 76-26130

The relationship between acoustic reflexes and loudness discomfort levels was investigated. Acoustic reflex thresholds and loudness discomfort levels were obtained from sixteen normal hearing subjects for nine stimuli including speech babble, a 1000 Hz pure tone and seven noise bands centered around 1000 Hz (10 Hz, 30 Hz, 100 Hz, 1/2, 1, 2, and 4 octaves). Acoustic reflex thresholds were measured on an electroacoustic impedance bridge and subjects tracked their loudness discomfort levels through the use of a recording attenuator. The study was designed to compare the acoustic reflex and loudness discomfort level along six dimensions: (1) mean thresholds, (2) acoustic reflex-loudness discomfort level correlations, (3) size of the critical bandwidth, (4) shape of threshold curves as a function of stimulus bandwidth, (5) pure tone vs. narrow band noise threshold, and (6) pure tone vs. speech thresholds.
Dissert. Abstr.

N77-13638 Washington Univ., Seattle.
EFFECTS OF RATE AND DIRECTION OF AIR PRESSURE CHANGES ON TYMPANOMETRY Ph.D. Thesis
Peggy Sue Williams 1976 178 p
Avail: Univ. Microfilms Order No. 76-25472

The effect of the variables of rate and direction on automatic tympanometry are explored. Three features of the tympanogram that might be affected by these variables, peak amplitude, peak pressure and shape, were examined in two distinctly different populations. Group I subjects had normal tympanic membranes, and Group II subjects had flaccid tympanic membranes. Both groups had apparently normal middle-ear function. Directly addressed were the questions: (1) what effect on amplitude, peak pressure, and shape of the tympanogram is generated by manipulation of the rate of air pressure change? and (2) what effect on amplitude, peak pressure, and shape of the tympanogram is generated by manipulation of the direction of air pressure change? The rate of air pressure change alters the amplitude of tympanograms in both groups, and direction has no effect.
Dissert. Abstr.

N77-13639 Wichita State Univ., Kans.
HEMISPHERIC ASYMMETRY OF PERCEPTUAL AND ELECTROENCEPHALIC RESPONSES TO SPEECH STIMULI Ph.D. Thesis
Marilyn Park Warren 1976 259 p
Avail: Univ. Microfilms Order No. 76-25358

Stimulus and task effects on perceptual and electroencephalic asymmetry of responses to speech stimuli were examined in a two-part investigation. A total of 18 subjects listened to diotic and dichotic consonant-vowel (CV) syllables consisting of a voiceless bilabial stop (/p/,/t/, or /k/) plus the vowel /a/, spoken by a man, woman, or child. The stimulus tape contained equal numbers of four types of CV pairs: diotic CV/diotic voice; diotic CV/dichotic voice; dichotic CV/diotic voice; and dichotic CV/dichotic voice. Subjects heard all stimuli twice, once performing a phonemic discrimination task in which they identified the two CVs which they perceived, and once performing a non-phonemic discrimination task in which they identified the two voices they perceived. Results for 12 right-handed female subjects showed a right ear advantage for the phonemic discrimination task but no ear advantage for the non-phonemic discrimination task.
Dissert. Abstr.

N77-13640 Illinois Univ., Urbana-Champaign.
INEQUALITY BETWEEN INSPIRED AND EXPIRED GASEOUS NITROGEN IN MAN: FACT OR TECHNICAL ARTIFACT? Ph.D. Thesis
Ingrid Charlotte Kupprat 1976 132 p
Avail: Univ. Microfilms Order No. 76-24122

Gaseous N2 exchange was measured in nine healthy young men, once while fasting and once 1 1/2 hours after high protein ingestion. Data were collected during bed rest for the last 3 hours of a 17-hour period of controlled diet, environment and activity. On the average, an N2 inequality was observed. High protein ingestion resulted in a significantly greater N2 evolution than fasting. However, there was a significant linear trend in the mean N2 evolved each hour. From comparison of the observed variations with subjects, diet and time with the expected variation of instrumentation to measure N2, it concluded that inequality between the minute volume of N2 inspired and expired at rest is a real phenomenon, not a technical artifact. These results raise questions as to the universal applicability of the traditional open-circuit technique for measuring respiratory gas exchange, which assumes that N2 inspired equals N2 expired.
Dissert. Abstr.

N77-13641 Ohio State Univ., Columbus.
THE EFFECT OF COLOR ON THE LOCALIZATION OF THE SOURCES OF THE HUMAN VISUAL EVOKED RESPONSE Ph.D. Thesis
James Patrick Ary 1976 108 p
Avail: Univ. Microfilms Order No. 76-24551

Stimulation of left or right half visual fields produces different evoked potential distributions across the occipital scalp. One model for the source of this potential distribution is an equivalent dipole located near the medial fissure and oriented tangential to the occipital scalp. It was found that stimulating with white lateral half checkerboard flashes produces two changes: (1) a shift toward a scalp surface-radial evoked potential distribution, and (2) a shift of localization toward the midline. To clarify the color dependence of this effect, the brightness of the adapting field was raised above rod saturation to 2,000 cd/sq m, and flashed checks of four different colors were employed as stimuli. Two of the three subjects tested showed potential distributions for

yellow stimuli which were distinctly different from the distributions for the other colors. Dissert. Abstr.

N77-13642 Washington Univ., Seattle.
TRANSIENT RESPONSES TO SHIFTS OF ANGLE OF ILLUMINATION IN RETINAL NEURONS Ph.D. Thesis
Jack Henrik Belgum 1976 79 p
Avail: Univ. Microfilms Order No. 76-25388

Intracellular recordings were made from Necturus retinal neurons. The retina was alternately illuminated by either of two large, overlapping fields of background light incident upon the retina at different angles. A test flash of the same angle of incidence as one of the two backgrounds was presented on each background in turn. The intensity of one of the two backgrounds was systematically varied over a range of intensities likely to include an intensity matching the other background. Cells exhibiting the properties of receptors responded to each exchange with a transient hyperpolarization that could not be explained by an intensity mismatch. Bipolar cells produced equal and sustantial responses to both exchanges at the matched intensity, as did amacrine cells. Ganglion cells also produced transient responses to exchange. Dissert. Abstr.

N77-13643 Pittsburgh Univ., Pa.
TRANSIENT PHYSIOLOGICAL RESPONSES TO STEP CHANGES IN WORK RATE Ph.D. Thesis
Thomas Edward Bernard 1975 96 p
Avail: Univ. Microfilms Order No. 76-25911

The transient responses of heart rate, pulmonary ventilation, oxygen uptake, and carbon dioxide elimination were measured on a breath-to-breath basis for six young men. Three pairs of step changes in work rate were applied on a laddermill ergometer such that each pair represented an increasing change and a decreasing change in work rate over the same range. The transfer functions relating the work application to the responses were determined through curve fitting. Heart rate responses were characterized by a second order function. Pulmonary ventilation was characterized by an immediate zero order change followed by a delayed first order change. Both oxygen uptake and carbon dioxide elimination followed a simple first order response. For pulmonary ventilation, oxygen uptake, and carbon dioxide elimination, the responses displayed the qualities of a linear system. The heart rate response displayed non-linear characteristics. Dissert. Abstr.

N77-13644 Virginia Univ., Charlottesville.
THE MICROCIRCULATORY BASIS OF FUNCTIONAL HYPEREMIA IN STRIATED MUSCLE Ph.D. Thesis
Richard John Gorczynski 1976 215 p
Avail: Univ. Microfilms Order No. 76-25012

An investigation of the microcirculation of striated muscle was undertaken in an effort to: (1) directly describe the behavior of the arterioles and capillary bed during striated muscle contraction, (2) investigate the hypothesis that a change in the oxygen tension of contracting striated muscle is involved either directly by an effect on the vascular smooth muscle of the arterioles, or indirectly, via an effect upon striated muscle metabolism in the medication of contraction induced arteriolar vasodilation, and (3) to investigate the possibility that the release of potassium by active muscle mediates the initiation of functional arteriolar vasodilation during contraction. Experiments were performed on the cremaster muscle of hamsters, prepared for in vivo microscopy of the microcirculation. Dissert. Abstr.

N77-13645 California Univ., Los Angeles.
HUMAN EEG RESPONSE TO CERTAIN RHYTHMIC PATTERNED AUDITORY STIMULI, WITH POSSIBLE RELATIONS TO EEG LATERAL ASYMMETRY MEASURES AND EEG CORRELATES OF CHANTING Ph.D. Thesis
Linda Jean Rogers 1976 119 p
Avail: Univ. Microfilms Order No. 76-25237

Human EEG responses to simple, rhythmic visual and auditory stimuli (sinusoidally modulated white light, and sinusoidally modulated white noise) were reported. In addition, a contrast-evoked response was reported for patterned rhythmic visual stimulation. A human EEG response to patterned auditory stimulation is investigated. The patterned rhythmic stimuli presented were music and chanting. The complex nonrhythmic stimulus was conversational speech. The EEG driving measures developed were studied in relation to two other areas of current EEG research. The first area concerns lateral asymmetries in EEG intensity (specifically, parietal alpha band (8-12 Hz) intensity) correlated with modes of cognition hypothesized to require differential participation of the cerebral hemispheres. The second related area concerns EEG correlates of religious meditation. Dissert. Abstr.

N77-13646 Saint Louis Univ., Mo.
HUMAN PHYSIOLOGICAL RESPONSE TO HYPERHYDRATION IN A HOT ENVIRONMENT Ph.D. Thesis
Ronald Alvin Weiss 1975 215 p
Avail: Univ. Microfilms Order No. 76-25831

The physiological responses of six hyperhydrated human male subjects working in both 23 C D.B. and 41 C D.B. environments were compared to their own normally hydrated control responses under the same test conditions. Hyperhydration was evoked by ingesting distilled, deionized water (37 C) with a volume equal to 2% of individual body weight and then sustained by periodic replacement of all fluids lost. After each resting subject sustained a diuresis of at least 12 ml/minute for 45 minutes, he exercised on a bicycle ergometer for two consecutive thirty minute periods. Plasma volume varied inversely with both ambient temperature and exercise level when normally hydrated but expanded 1-2% above resting control values when hyperhydrated and exercising in the 23 C environment. Plasma osmolality and sodium concentration decreased about 1%, and protein concentration decreased approximately 4% in the presence of this expanded plasma volume. Dissert. Abstr.

N77-13647 Wisconsin Univ., Madison.
EFFECT OF LOAD, SPEED, AND CONFIGURATION ON THE ELECTROMYOGRAPHIC ACTIVITIES OF THE SKELETAL MUSCLES Ph.D. Thesis
Norman Richard Miller 1976 437 p
Avail: Univ. Microfilms Order No. 76-18898

The feasibility of utilizing the electromyographic output of the skeletal muscles (in conjunction with a mathematical musculoskeletal model) for quantification of muscle response to load and speed variations during human activities is examined. The superficial muscles of the lower extremity are considered. A specially instrumented bicycle ergometer is used to provide controlled (and reasonably repetitive) activity cycles for different load and speed conditions. The electromyograms from ten superficial muscles are treated by several data analysis techniques including spectral evaluations of the nonstationary signal. A noval hybrid computing procedure enabling static simulation of the dynamic activity at a particular posture is described. Results are discussed. Dissert. Abstr.

N77-13648*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
STARPAHC INTERIM EVALUATION REPORT, MAY 1975 - APRIL 1976
15 Jun. 1976 164 p
(Contract NAS9-13170)
(NASA-CR-151126; LMSC-D500704) Avail: NTIS HC A07/MF A01 CSCL 06E

The primary goals of the STARPAHC Program are to provide data for developing health care for future manned spacecraft, and to establish the feasibility of the STARPAHC concept for improving the delivery of health care to remote areas on earth. Accordingly, the hardware and medical evaluations initiated during the first 6 months of system operation were continued and expanded during the second 6-month period. The evaluations are based on what has proven to be a relatively stabilized 6-month period wherein system failures which occurred during the initial shakedown period in the first 6 months have been minimized. Early trends and performance data reported in the first semi-annual report were reexamined to either verify, modify or change earlier conclusions. The highlights are given of the total year of operation with emphasis on comparisons between the first and second semi-annual reporting period. In addition, an early analysis of costs is summarized. Author

N77-13649# Nederlands Instituut voor Praeventieve Geneeskunde TNO, Leiden.

RECORDING AND PROCESSING OF ELECTROENCEPHALOGRAMS: DESCRIPTION OF TECHNIQUES [REGISTRATIE EN VERWERKING VAN ELECTRO ENCEPHALOGRAMMEN: BESCHRIJVING VAN METHODIEKEN]

J. D. Nije and H. P. DeRoos Jun. 1975 47 p refs In DUTCH

Avail: NTIS HC A03/MF A01

A method to record electroencephalography (EEG) data on magnetic tape and to process the data by means of a digital computer is described. The IBM-1800 computer was used to digitalize and filter the EEG signals for processing on an IBM-370 computer. Using FORTRAN 4 the following spectra can be calculated: auto spectrum, cross-spectrum, and coherence function. The reliability of these spectra is discussed and the Spest (spectrum estimation) program is dealt with. The EEG recording system was tested by noise measurement, involving Fourier transformation. ESA

N77-13650# Naval Medical Research and Development Command, Bethesda, Md.

BIBLIOGRAPHY OF REPORTED BIOLOGICAL PHENOMENA (EFFECTS) AND CLINICAL MANIFESTATIONS ATTRIBUTED TO MICROWAVE AND RADIO-FREQUENCY RADIATION, SUPPLEMENT NUMBER 7 Medical Research Interim Report

Zorach R. Glaser May 1976 30 p refs

(MF51524015)

(AD-A025354) Avail: NTIS HC A03/MF A01 CSCL 06/18

More than 350 additional references on the biological responses to radio frequency and microwave radiation, published up to May 1976, are included in this bibliography of the world literature. Particular attention has been paid to the effects of non-ionizing radiation on man at these frequencies. The citations are arranged alphabetically by author (where possible), and contain as much information as possible so as to assure effective retrieval of the original documents. Soviet and East European literature is included in detail. This report is the seventh supplementary 'up-dated' bibliographic listing to Naval Medical Research Institute. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N77-13651# Nederlands Instituut voor Praeventieve Geneeskunde TNO, Leiden.

WORKLOAD OF THE RADAR-AIR TRAFFIC CONTROLLERS AT SCHIPHOL Interim Report [INTERIMRAPPORT WERKBELASTING RADAR-LUCHTVERKEERSLEIDERS SCHIPHOL]

C. K. Pasmooij Jun. 1975 29 p refs In DUTCH

(IR-1) Avail: NTIS HC A03/MF A01

The workload at the Amsterdam airport was measured with a view to analyzing mental load factors and to studying the effect of task performance on the air traffic controller. Number and content of the air traffic information strips, radio telephony communication, coordination with other air traffic sectors, and telephone calls with other air traffic control centers were registered for five air traffic controllers during the week of Aug. 6, 1973. The results of the task analysis parameters were evaluated and preliminary conclusions were made. ESA

N77-13652# Tufts Univ., Medford, Mass. Inst. for Psychological Research.

HUMAN FACTORS ENGINEERING BIBLIOGRAPHIC SERIES. VOLUME 5: 1967 LITERATURE

Paul G. Ronco and Stanley Lippert Mar. 1976 294 p

(AD-A025395; HEL-Bib-Vol-5) Avail: NTIS HC A12/MF A01 CSCL 05/5

This document is the fifth in a series of bibliographies covering the human factors engineering literature. It covers most of the journal target articles for the year 1967. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N77-13653 Wayne State Univ., Detroit, Mich.

VALIDATION STUDY OF THREE-DIMENSIONAL CRASH VICTIM SIMULATOR FOR PEDESTRIAN-VEHICLE IMPACT Ph.D. Thesis

Arvind Jiwajee Padgaokar 1976 315 p

Avail: Univ. Microfilms Order No. 76-26164

Minimizing injury during pedestrian vehicle impacts is studied using analytical simulation. The bases for the validation of a complex three-dimensional model are proposed. A method for the accurate measurement of three dimensional angular acceleration was developed and used to define completely the kinematics of the pedestrian three dimensional motion. For the sake of interchangeability of data, anatomically based coordinate systems were defined for many body segments using anthropometric landmarks. A brief description of the three-dimensional crash victim simulator is given. Impact data obtained under three different situations were used for validation of the model. A comparison between the experimental response and that generated by the analytical simulation was made. Dissert. Abstr.

N77-13654 Wayne State Univ., Detroit, Mich.

FULL SCALE EXPERIMENTAL SIMULATION OF PEDESTRIAN-VEHICLE IMPACTS Ph.D. Thesis

Kenneth Wayne Krieger 1976 290 p

Avail: Univ. Microfilms Order No. 76-26150

A series of eight full-scale experiments simulating pedestrian vehicle impacts was carried out using an extensively instrumented anthropomorphic dummy and four equally well instrumented unembalmed cadavers. Tests sought to establish body segment kinematics, including linear and angular acceleration. Impact characteristics during initial contact with the vehicle were studied in relation to those during subsequent ground contact. Further experiments were performed to determine force deflection characteristics of vehicle-pedestrian contact, anthropometric (inertial) properties of human body segments, and spring and viscous coefficients of the joints and joint stops. Dissert. Abstr.

N77-13655*# Martin Marietta Corp., Denver, Colo.

COMPARISON OF THE NONLINEAR DYNAMIC CHARACTERISTICS OF BARBER S-2 AND ASF RIDE CONTROL FREIGHT TRUCKS

P. Abbott Sep. 1976 42 p refs

(Contract NAS8-29882)

(NASA-CR-150113; MCR-76-475) Avail: NTIS HC A03/MF A01 CSCL 05H

The results of an experimental and analytical program to define the load deflection characteristics of a Barber S-2 freight truck and to compare these characteristics to those of an ASF freight truck of the same load capacity are presented. The comparison of the two trucks is made on a parameter basis and on the basis of the wheel/rail loads induced by track misalignment. The results indicate there is very little difference in the parameters and the response of the two trucks. This is of course qualified by the assumptions required in the development of the mathematical models. Author

N77-13656# Nederlands Instituut voor Praeventieve Geneeskunde TNO, Leiden.

HUMAN COMMAND AND CONTROL TASKS: DESCRIPTION OF AN INVESTIGATION ON FOUR DIFFERENT COMMAND AND CONTROL TASKS [MENSELIJKE STUUR- EN REGELTAKEN. VERSLAG VAN EEN ONDERZOEK BIJ VIER VERSCHILLENDE STUUR- EN REGELTAKEN]

C. L. Ekkers, W. T. M. Ooijendijk, and J. J. Schwarz Aug. 1975 141 p refs In DUTCH Sponsored in part by Min. van Econ. Zaken, and Min. van Sociale Zaken

Avail: NTIS HC A07/MF A01

The pilot phase of an investigation on the conditions under which command and control tasks are carried out was analyzed. The investigation was made on the personal, task, and social system level. The planning of the investigation is dealt with and

the four tasks are described: train scheduling of the Netherlands Railways; operation and control of a natural gas based power station; hospital patients under narcosis; power supply and safety of the Netherlands Railways. Observations of the tasks were made and questionnaires were filled in. The results are discussed and preliminary conclusions drawn. ESA

N77-13657# Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.

PILOT'S TRACKING BEHAVIOUR UNDER ADDITIONAL WORKLOAD

R. J. A. W. Hosman Jun. 1975 91 p refs
(VTH-199) Avail: NTIS HC A05/MF A01

An experiment to study the influence of task interference on the information processing of the human pilot is described. Two hypothetical limited capacity models of human information processing, the multi-channel model and the single-channel model, are reviewed and the results of the experiment are discussed in relation to these models. The experimental task consisted of a single axis tracking task under additional workload. The three controlled elements used were a simulated transport aircraft at three different center of gravity positions, at which it was stable, neutral, and ustable, respectively. The forcing function was a gust signal acting on the simulated aircraft. The additional loading task was an auditory binary choice task. The results of the experiment tend to favor the single-channel model of human information processing. Author (ESA)

N77-13658# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

LOW VISIBILITY LANDING PILOT MODELING EXPERIMENT AND DATA, PHASE 1 Final Report, May - Sep. 1974

Randall V. Gressang, Daniel L. Kugel, John R. Stone, and Joseph E. Pollard Apr. 1976 394 p refs
(AF Proj. 2187)
(AD-A025885; AFFDL-TR-75-41) Avail: NTIS HC A17/MF A01 CSCL 01/2

This report describes an experiment conducted to provide data for constructing a mathematical pilot model for low visibility landing. The experiment was conducted using a hybrid flight simulator equipped with a three degree of freedom motion system and a terrain board visual system. The aircraft simulated was a C-135B, and low visibility was simulated using a sky plate in the visual system. Pilots were obtained from the USAF Instrument Flight Center. Gust disturbances were used to increase pilot workload. The worst visibility simulated was Category 2 minimums. GRA

N77-13659# Army Combined Arms Combat Developments Activity, Fort Leavenworth, Kans.

ANALYSIS OF PHASE 2A OF FE 43.8

Rudolph J. Pabon, Robert A. Davison, and William I. Parks Feb. 1976 90 p refs
(AD-A025823; CACDA-TR-2-76) Avail: NTIS HC A05/MF A01 CSCL 17/8

This report analyzes data collected from Field Experiment 43.8, the ground-to-air visual detection experiment. Phase IIA was a one-sided experiment using AH-1G and OH-58 helicopters for detection at ranges from 1 to 5 kilometers by ground observers with unaided vision. The experiment provided data on the time required for a ground observer to detect an observation helicopter, an attack helicopter (AH), or an attack helicopter team (AHT) and the frequency of detection for each configuration while situated in a firing position. Independent variables tested in the experiment were range, search sector, canopy or no canopy helicopters, lateral or no lateral movement, sky or terrain background, single ship or helicopter team presentation, and for multiple pop-up tactics, elapsed time between first and second pop-up, and location of the second pop-up with respect to the initial pop-up. Data gained from this experiment, when coupled with data from Phase IIB, the air-to-ground experiment, will produce information required to develop helicopter employment tactics. Detection time determined from the analysis of the data will be used in subsequent experiments as a guide for constraining helicopter pop-up times to reduce AHT vulnerability. GRA

N77-13660# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

A SCORING SYSTEM FOR THE QUANTITATIVE EVALUATION OF PILOT PERFORMANCE DURING MICROWAVE LANDING SYSTEM (MLS) APPROACHES Interim Technical Report, Oct. 1974 - Jan. 1975

Christopher J. Hyatt and Oak H. DeBerg Aug. 1975 23 p refs
(AD-A025782; ASD-TR-75-17) Avail: NTIS HC A02/MF A01 CSCL 05/9

The Crew Station Design Facility's scoring system for ILS approaches and landings has been extended for use with Microwave Landing System (MLS) approaches. The philosophy of scoring systems is briefly discussed, and the rationale for this application is developed. GRA

N77-13661# Army Aeromedical Research Lab., Fort Rucker, Ala.

DYNAMIC VISUAL ACUITY IN FATIGUED PILOTS Final Report

Isaac Behar, K. A. Kimball, and D. A. Anderson Jun. 1976 15 p refs
(DA Proj. 3A0-62110-A-819)
(AD-A027663; USAARL-76-24) Avail: NTIS HC A02/MF A01 CSCL 17/8

Six rotary wing aviators were subjects in a continuous operation regimen involving some 12 hours of flying and 3.5 hours sleep daily for five days. Estimates of performance on a dynamic visual acuity (DVA) task were obtained several times each day during the study using target velocities of 25 deg. and 40 deg./sec. DVA performance varied significantly during the fatigue regimen when measurements were made with target velocities of 40 deg./sec; with lower velocity targets differences in DVA scores were not significant. This indicates the need to tax the oculomotor system to demonstrate fatigue effects. Fatigue effects were partially obscured by practice effects which are considerable in the DVA task. DVA scores correlated only modestly with subjective estimates of fatigue intensity and flying performance, and IP ratings of performance, but the cluster of correlations provided a consistent picture. Author (GRA)

N77-13971 European Space Agency, Paris (France).

DISCRETE TIME MODELLING OF HUMAN PILOT BEHAVIOUR

Dominique Soulatges, Daniel Cavalli et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-2 (ESA-TT-352) Nov. 1976 p 1-25 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. 1976 P 63-73 Presented at the 11th Ann. Conf. on manual Control, Moffett Field, Calif., 21-23 May 1975 (For primary document see N77-13970 04-99)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N77-13662 Stanford Univ., Calif.
PERFORMANCE ANALYSIS OF CACHE MEMORIES Ph.D. Thesis
Gururaj Seshagiri Rao 1976 111 p
Avail: Univ. Microfilms Order No. 76-26063

This study is concerned with the analysis of the performance of various buffer organizations in a two level demand paged memory system using a Cache. The buffer organizations are described, namely the fully associative buffer, the direct mapping buffer, the set associative buffer, and the sector buffer. It also discusses the use of the limiting page fault rate as the performance indicator and the use of the independent reference model to describe program behavior. It is shown how to compute the fault rates of the direct mapping buffer, the set associative buffer, and the sector buffer, using King's results for the fully associative buffer where appropriate. The performances of the sector buffer and its equivalent fully associative buffer are compared.
Dissert. Abstr.

N77-13663 British Library Lending Div., Boston Spa (England).
THE SIGNIFICANCE AND TASKS OF DATA COMMUNICATION
Dieter Letsche May 1976 15 p ref Transl. into ENGLISH from Nachrtech. Z. (Brunswick), v. 3, no. 29, 1976 p 211-214 (BLL-Trans-3371-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.

Data communication is a prerequisite for decentralized data processing. The utilization of computer capacity and the possibility of access to information banks give rise to a great demand for data communication. The increase in the productivity of industry and public administration is vitally dependent on the extent to which computer capacity and data can be made available at every place of work.
Author.

N77-13664 Stanford Univ., Calif.
USE OF META LEVEL KNOWLEDGE IN THE CONSTRUCTION AND MAINTENANCE OF LARGE KNOWLEDGE BASES Ph.D. Thesis
Randall Davis 1976 266 p
Avail: Univ. Microfilms Order No. 76-25988

The MYCIN system, designed to assist in the task of diagnosis and the therapy selection for infectious diseases, was used for this project. The two major goals set were to make it possible for an expert in the domain of application to 'educate' the consultation program directly, and to make it possible to assemble and maintain large amounts of knowledge. The central theme of this work was the exploration and use of meta level knowledge which makes possible a system which has both the capacity to use its knowledge directly, and the ability to examine it, abstract it, and direct its application. Efforts to enable a program to explain its actions, by giving it a model of its control structure, and an understanding of its representations are described. The use of abstracted models of knowledge (rule models) as a guide to acquisition is documented. The utility of describing to a program the structure of its knowledge base (using data structure schemata) is demonstrated. Finally, the use of strategies in the form of meta rules, which contain knowledge about the use of knowledge, is described.
Dissert. Abstr.

N77-13665 Stanford Univ., Calif.
COMPUTER STORAGE HIERARCHY MODELS AND ANALYSIS Ph.D. Thesis
John Albert Mortenson 1976 147 p
Avail: Univ. Microfilms Order No. 76-26044

Storage hierarchies of computer systems are analyzed. Methods of computing fault rates are extended and reviewed. Detailed models (both queuing and non-queuing) are developed to study the effects of different memory update policies on hierarchy performance. The independent reference model is defined, and two replacement algorithms are considered.
Dissert. Abstr.

N77-13666 Iowa Univ., Iowa City.
PARALLEL NUMERICAL COMPUTATION Ph.D. Thesis
Ashoke Deb 1976 196 p
Avail: Univ. Microfilms Order No. 76-26278

Parallel and efficient numerical computation are specified by the generalized arithmetic expression, which consists of finite well-formed string of parentheses, operands and operators having a fixed precedence relation among them and having arbitrary execution times. An optimal algorithm is presented for the parallel processing of arithmetic expression in the most general case. A proof of optimality is presented by developing a new proof technique based on the concept of effective operands' associated with the execution tree (an equivalent of a parse tree with real time coordinate). Other advantages of the algorithm are: one pass compilation, no conversion to polish string, independent of the initial form of the input string, the depth of recursion is equal to the number of types of operators present in the expression, and the computational complexity is linearly proportional to the number of operators present in the expression.
Dissert. Abstr.

N77-13667 State Univ. of New York, Buffalo.
FAULT DETECTING COMPUTER SYSTEMS DESIGN Ph.D. Thesis
Kiluba Na-Beya Pembamoto 1976 191 p
Avail: Univ. Microfilms Order No. 76-26555

Design concepts of fault detecting computer systems are investigated with respect to their fault detection capabilities and overall systems complexities. Digital systems are reviewed as a subclass of finite state machines. Fault tolerant systems design techniques are considered. A review of the state of the art in fault detection is given with emphasis on implemental concepts and techniques. A discussion of the level at which redundancy should be applied is presented. Availability functions are developed as a measure of goodness of fault detecting computer systems. A new approach concept is introduced which allows for error detection in the substructure and has lower redundancy factor.
Dissert. Abstr.

N77-13668*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GROUND DATA HANDLING FOR LANDSAT-D
Thomas J. Lynch Nov. 1976 9 p Presented in the Proceedings of the William T. Pecora Memorial Symp., Sioux Falls, S. D., Oct. 1976
(NASA-TM-X-71237; X-930-76-264) Avail: NTIS HC A01/MF A01 CSCL 05B

The present plans for the LANDSAT D ground data handling are described in relationship to the mission objectives and the planned spacecraft system. The end to end data system is presented with particular emphasis on the data handling plans for the new instrument, the Thematic Mapper. This instrument generates ten times the amount of data per scene as the present Multispectral Scanner, and this resulting data rate and volume are discussed as well as possible new data techniques to handle them such as image compression.
Author

N77-13669# PRC Information Sciences Co., McLean, Va.
GRAPHIC LINE SYMBOLIZATION SYSTEM. VOLUME 1: SYSTEMS ANALYSIS AND DESIGN Final Technical Report, Sep. 1973 - Apr. 1975
Paul D. Bell, John A. Neuffer, and M. Lynn Taylor Griffiss AFB, N. Y. RADC Mar. 1976 92 p 3 Vol.
(Contract F30602-74-C-0027; AF Proj. 3202)
(AD-A025686; RADC-TR-86-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report documents work performed in the development of a Graphic Line Symbolization System (GLSS) for the Defense Mapping Agency-Aerospace Center. GLSS provides a wide range of data processing capabilities related to cartographic symbology. These include all lineal symbols and many point symbols to support and 1:200,000 series chart production. The system also includes a number of line cleaning and data culling functions. The system has been designed to be highly flexible as to input/output options and symbol specifications build, update and override. The report is in three volumes: Volume 1 - System Analysis and Design; Volume 2 - System Implementation, Operating Procedures and Testing; and Volume 3 - Program Documentation.
GRA

N77-13670# PRC Information Sciences Co., McLean, Va.
GRAPHIC LINE SYMBOLIZATION SYSTEM. VOLUME 2: SYSTEM IMPLEMENTATION, OPERATING PROCEDURES AND TESTING Final Technical Report, Sep. 1973 - Apr. 1975
Paul D. Bell, John A. Neuffer, and M. Lynn Taylor Griffiss AFB, N. Y. RADC Mar. 1976 93 p 3 Vol.
(Contract F30602-74-C-0027; AF Proj. 3202)
(AD-A025687; RADC-TR-76-86-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

The purpose of Volume 2 of the Final Technical Report is to describe the major attributes of the system implementation, system operating procedures, and summary results of system testing. GRA

N77-13671# PRC Information Sciences Co., McLean, Va.
GRAPHIC LINE SYMBOLIZATION SYSTEM. VOLUME 3: PROGRAM DOCUMENTATION Final Technical Report, Sep. 1973 - Apr. 1975
Paul D. Bell, John A. Neuffer, M. Lynn Taylor, and Gary W. Virkler Griffiss AFB, N. Y. RADC Mar. 1976 283 p 3 Vol.
(Contract F30602-74-C-0027; AF Proj. 3202)
(AD-A025688; RADC-TR-76-86-Vol-3) Avail: NTIS HC A13/MF A01 CSCL 09/2

The purpose of Volume 3 of the Final Technical Report is to describe the GLSS software in terms of the general operating environment and specific program modules. GRA

N77-13672# Automatic Data Processing Equipment Selection Office (Navy), Washington, D.C.
COBOL COMPILER VALIDATION SYSTEM, 1968. VERSION 6.2: IMPLEMENTATION DOCUMENTATION (USERS GUIDE), VOLUME 2
28 Apr. 1976 102 p
(AD-A024913; USN-CCVS-68-Vol-02; DOD/DF-76/001A) Avail: NTIS HC A06/MF A01 CSCL 09/2

This document represents the implementation information necessary to implement the 1968 U. S. Navy COBOL Compiler Validation System (CCVS). The 1968 CCVS will consist of audit routines, their related data, and an executive routine (VP-Routine) which prepares the audit routine for compilation. Each audit routine is a COBOL program which includes many tests and supporting procedures indicating the result of the tests. The audit routines collectively contain all of the features of American National Standard Programming Language COBOL - X3.23-1968 (except for the ENTER statement of the Nucleus module) as specified in Federal Information Processing Standard (FIPS) 21. The COBOL Compiler Validation System (CCVS68) Tape is available from NTIS as report number AD-A024912. GRA

N77-13673# Automatic Data Processing Equipment Selection Office (Navy), Washington, D.C.
HYPO-COBOL COMPILER VALIDATION SYSTEM HCCVS - TEST SPECIFICATIONS
8 Apr. 1976 443 p
(AD-A024915; DOD/DF-76/002A) Avail: NTIS HC A19/MF A01 CSCL 09/2

HYPO-COBOL is a proper subset of the full American National Standard Programming Language COBOL as defined in ANSI X3.23-1974. It is oriented toward a compiling system which need not place heavy demands on its environment in terms of time and space and provides functional capability above and beyond the minimum definition of COBOL. Most of the elements selected for inclusion in HYPO-COBOL are required in any implementation of a low-level COBOL compiler as defined in FIPS PUB 21-1. However, HYPO-COBOL is not a proper subset of low-level COBOL in that (1) it does not contain all elements of low level COBOL, and (2) does contain selected elements from higher levels of COBOL. GRA

N77-13674# Automatic Data Processing Equipment Selection Office (Navy), Washington, D.C.
HYPO-COBOL COMPILER VALIDATION SYSTEM HCCVS - IMPLEMENTATION DOCUMENT
8 Apr. 1976 39 p
(AD-A024916; DOD/DF-76/002B) Avail: NTIS HC A03/MF A01 CSCL 09/2

For abstract, see N77-13673.

N77-13675# Michigan Univ., Ann Arbor. Dept. of Industrial and Operations Engineering.
A THEORETICAL ANALYSIS ON DATA DEFINITION AND TRANSLATION Final Report
A. G. Merten 1976 15 p refs
(Contract AF-AFOSR-2219-72; AF Proj. 9769)
(AD-A025199; AFOSR-76-0556TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Over the past four years of research for AFOSR, considerable progress has been made toward development of a data translation methodology. A model for implementing data translators has been formulated and verified through a series of increasingly more general data translators. Mechanisms for prescribing stored-data transformations and descriptions, a Stored-Data Definition Language, and Translation Definition Language to direct the data translator have developed. Author (GRA)

N77-13676# Federal COBOL Compiler Testing Service, Washington, D.C.
COBOL COMPILER VALIDATION SUMMARY REPORT
1 Jun. 1976 48 p
(AD-A025889; CCVS68-VSR145) Avail: NTIS HC A03/MF A01 CSCL 09/2

This Validation Summary Report (VSR) provides a consolidated summary of the results obtained from the validation of the subject compiler. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by Federal level module; a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N77-13677# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
THE TERMINAL INTERFACE MESSAGE PROCESSOR PROGRAM
May 1976 229 p refs Revised
(Contracts DAHC15-69-C-0179; F08606-73-C-0027; Contract F08606-75-C-0032)
(AD-A025888; Rept-91) Avail: NTIS HC A11/MF A01 CSCL 09/2

Contents: Overview of the terminal IMP hardware; Software summary; Performance summary; Summary of protocol design decisions and protocol deviations; References and TIP bibliography; Storage layout; Data structures; Detailed software description. GRA

N77-13678# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
COPYING LIST STRUCTURES WITHOUT AUXILIARY STORAGE Interim Report
Douglas W. Clark Oct. 1975 32 p refs
(Contract F44620-73-C-0074; ARPA Order 2466)
(AD-A025173; AFOSR-76-0599TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

An algorithm is presented for copying an arbitrary list structure into a block of contiguous storage locations without destroying the original list. Apart from a fixed number of program variables, no auxiliary storage, such as a stack, is used. The algorithm needs no mark bits and operates in linear time. It is shown to be significantly faster than the best previous algorithm for the same problem. Author (GRA)

N77-13679# Southern Research Inst., Birmingham, Ala.
INSTRUCTION AND OPERATION MANUAL FOR THE DIGITAL TRACKER
7 May 1976 108 p
(Contract DAAH01-75-C-0790)
(AD-A025419; SORI-EAS-76-223; SORI-3493-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

The Digital Tracker is a version of the Adaptive Gate TV Tracker. It produces azimuth and elevation error signals from raster scan signals such as those produced by TV cameras and imaging IR seekers. The Digital Tracker uses a minicomputer for position calculation and auxiliary circuits for video processing and computer interface functions. The minicomputer program can be easily modified to test different tracking algorithms. GRA

N77-13680# National Oceanic and Atmospheric Administration, Suitland, Md. Office of Management and Computer Systems.
ORGANIZATION CHART GENERATION USING COMPUTER GRAPHICS
Theodore R. Sabine Apr. 1976 76 p refs
(PB-257223/8; NOAA-TM-ADMIN-OMCS-1; NOAA-76060902) Avail: NTIS HC A05/MF A01 CSCL 09B

The generation of organization charts using computer graphics is described. Chart input data, entered from an input file, are processed by an IBM 360/195 FORTRAN program using the NOAA FR 80 integrated graphics system. Computer output is written onto a magnetic tape which is processed on an FR 80 microfilm recorder to produce a film strip containing images of the organization charts. The images can be recorded either at 310mm full size or at a 35mm reduction. After the film strip is developed on an off-line processor, the 35mm chart images can be enlarged to any desired size. GRA

N77-13681# Hunter Associates Lab., Inc., Fairfax, Va.
STATE-OF-THE-ART IN IMPROVED PARTS PROGRAMMING FOR NUMERICALLY CONTROLLED MACHINES Final Report
Donald L. Allen, N. J. Fox, Jr., and R. E. Goforth Jun. 1976 97 p refs
(Contract DAAG47-76-C-0024)
(AD-A026231) Avail: NTIS HC A05/MF A01 CSCL 13/8

Numerical Control (NC) Technology deals with the control of process motion or action by numerically coded instructions. Applied to manufacturing, NC commands interface a machine through electric or hydraulic drive systems. The technology, born of federally sponsored research, has spread to all sectors of manufacturing. The federal inventory is 1700 machines, valued at $350 million with 613 in the Department of Defense. This report examines the current state-of-the-art of Numerical Control Manufacturing Technology, emphasizing efforts to standardize tooling and software. GRA

N77-13682# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
THE INTERFACE MESSAGE PROCESSOR PROGRAM
Jun. 1976 125 p refs
(Contracts DAHC15-69-C-0179; F08606-75-C-0032)
(AD-A025358; Tech-Inform-89-Rev) Avail: NTIS HC A06/MF A01 CSCL 09/2

The ARPA Network has been in operation for over five years and has become an international facility. The network has grown to almost sixty sites spread across the continental United States, plus satellite connections to Hawaii, Norway, and England, and is steadily growing; approximately one hundred independent computer systems of varying manufacture are interconnected. Provisions have been made for terminal access to the network from sites which do not enjoy the ownership of an independent computer system. Implementation of the IMPs required the development of a sophisticated computer program. As stated then, the principal function of the IMP program is the processing of packets, including the following: segmentation of Host messages into packets; receiving; routing, and transmitting store-and-forward packets; retransmitting unacknowledged packets; reassembling packets into messages for transmission into a Host; and generating RFNMs and other control messages. The program also monitors network status, gathers statistics, and performs on-line testing. GRA

N77-13683# Wisconsin Univ., Milwaukee. Dept. of Electrical Engineering.
PRESERVING AVERAGE PROXIMITY IN ARRAYS Interim Report
Richard A. DeMillo, Stanley C. Eisenstat (Yale University), and Richard J. Lipton (Yale University) 10 Mar. 1976 14 p refs
Prepared in cooperation with Yale Univ., New Haven
(Contract N00014-67-A-0097-0016; Grants DAHC04-74-G-0179; NSF DCR-74-12870)
(AD-A027360; UWM-TR-CS-76-4; ARO-12142.4-EL) Avail: NTIS HC A02/MF A01 CSCL 12/1

The combinatorial problem of storage arrays as various kinds of list structures is examined. Embeddings of graphs are used to model the loss of proximity involved in such storage schemes, and an elementary proof that arrays cannot be stored as linear lists with bounded loss of proximity is presented. Average loss of proximity is then considered, and it is shown that arrays cannot be stored as linear lists with only bounded loss of average proximity, but can be so stored in binary trees. The former result implies that row major order is an asymptotically optimal storage strategy for arrays. Author (GRA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N77-13684 Southwestern Louisiana Univ., Lafayette.
AN INVESTIGATION INTO MULTI-LEVEL PROGRAM ABSTRACTIONS FOR A SYSTEMATIC PICTURE PROGRAMMING LANGUAGE Ph.D. Thesis
J. Richard Newman 1976 158 p
Avail: Univ. Microfilms Order No. 76-23970

The methods presented for improving this process involve the human problem solver, the man machine communication media, and the functions the computer performs. The basic approach is to link the visualization of the problem to multilevel abstractions for program specification. This is accomplished by using pictures and symbols to represent abstractions at various levels of program development. The picture abstractions are chosen to represent useful high level programming constructs. These pictures and the corresponding lexical constructs provide multilevel abstractions during the problem solving process. Experiments are conducted using these multilevel blue-print abstractions in an educational environment for static program development. The use of this method of program development is shown to improve the production of correct solutions by 25%. Dissert. Abstr.

N77-13685 Stevens Inst. of Tech., Hoboken, N.J.
AN ABSTRACT THEORY OF MACHINE INSTRUCTIONS Ph.D. Thesis
Alessandro Charles Calianese 1976 91 p
Avail: Univ. Microfilms Order No. 76-25158

A mathematical model of a wide class of digital computers is provided. The concepts of instruction types, programs, fixed programs, self-modifying programs, direct address instructions, indirect address instructions, conditional instructions and unconditional instructions are defined and investigated. One major result is the study of the structural trade offs with respect to the above concepts and programs computing the partial recursive functions. It is also shown that there is a basic difference between machine language instructions as defined and a common class of high level language instructions. A closed result is also obtained showing the difference between fixed and self-modifying programs. Finite machines are investigated, and some results are reported. Dissert. Abstr.

N77-13686 New Mexico Univ., Albuquerque.
A NUMERICAL ALGORITHM FOR THE SOLUTION OF IMPLICIT ALGEBRAIC-DIFFERENTIAL SYSTEMS OF EQUATIONS Ph.D. Thesis
John William Starner, Jr. 1976 92 p
Avail: Univ. Microfilms Order No. 76-25681

An algorithm for the solution of systems of equations of the form $G(y',y,t) = 0$ is presented. This is a variable step size variable order predictor-corrector algorithm. The algorithm is then extended for the problem where the dimension of G is larger than that of y. This is a nonsquare (over determined) problem. If a solution to this problem exists, reasonable conditions which insure convergence to this solution are presented. A FORTRAN computer code based on the square algorithm is presented. The extension of the computer code to the nonsquare problem is discussed. The algorithm is shown to be stiffly stable. Some examples are presented which demonstrate how the algorithm will handle some mathematically ill-posed problems. The algorithm for square problems is then made part of an algorithm to compute a best approximation to a given function from a space of basis functions. Dissert. Abstr.

N77-13687 Stanford Univ., Calif.
MODELING THE WRITE BEHAVIOR OF COMPUTER PROGRAMS

Frank Shi-Kong Yu 1976 185 p
Avail: Univ. Microfilms Order No. 76-26096

The effects of page write cost upon the performance of page replacement algorithms were investigated. A new criterion, the total page transportation cost, for evaluating the performance of page replacement algorithms was proposed. The effects of changing page size upon a program's page write behavior were also studied. Hypothetical page trace patterns were constructed to illustrate the way in which a program's reference characteristics affect its page write activity as the page size changes. In order to charaterize a program's write activity, stochastic program behavior models were proposed that are capable of generating modify references. An extended independent reference model is also reviewed. Dissert. Abstr.

N77-13688 Illinois Univ., Urbana-Champaign.
CONTROL AND DATA DEPENDENCE FOR PROGRAM TRANSFORMATIONS
Ross Albert Towle 1976 118 p
Avail: Univ. Microfilms Order No. 76-24191

Transformations on blocks of assignment statements, IFs outside DO loops, and IF free DO loops are summarized. Transformations on DO loops that contain IFs are presented in detail. After these transformations have been performed it is possible to assign the execution orderings to obtain the best known execution time. Methods for automatic detection of data dependence are presented in this thesis. Also the complexity of several transformations is calculated. Finally, the transformations are demonstrated on portions of real programs. Dissert. Abstr.

N77-13689 Stanford Univ., Calif.
SOURCE CODING ALGORITHMS FOR FAST DATA COMPRESSION Ph.D. Thesis
Richard Clark Pasco 1976 113 p
Avail: Univ. Microfilms Order No. 76-26055

Noiseless source coding, or noiseless data compression, is a one-to-one mapping between data and a more compact representation. Invertible arithmetic algorithms are presented which encode strings of random source symbols with known conditional probabilities into strings of symbols for a channel. One algorithm encodes blocks of fixed length into codewords satisfying the prefix condition whose expected length exceeds the source Shannon entropy by at most two symbols plus an exponentially decreasing function of computational precision. The new process differs from previous coding algorithms, such as Huffman coding, in that computation time grows only linearly with block length, permitting real-time compression at rates arbitrarily close to the source entropy rate by using very long blocks. A similar algorithm encodes variable length source strings into fixed size codewords with comparable results.Dissert. Abstr.

N77-13690 Princeton Univ., N.J.
COMPLEXITY OF NUMERICAL ALGORITHMS FOR POLYNOMIALS Ph.D. Thesis
Francis Yuk-Lun Chin 1976 116 p
Avail: Univ. Microfilms Order No. 76-23820

The sequential complexity of several numerical problems is investigated. Asymptotic time bounds (as the problem size grows) are considered, and new algorithms with better asymptotic behavior are presented. Algorithms which are efficient for small problem size are given. Dissert. Abstr.

N77-13691 Texas Univ., Austin.
MICROPROGRAM OPTIMIZATION THROUGH ARCHITECTURAL ANALYSIS Ph.D. Thesis
Richard Lee Kleir 1976 151 p
Avail: Univ. Microfilms Order No. 76-26649

A translator is proposed for microcoded macro expansion from an assembly language process description. Optimization for the time and space improvements by computational environment adjustments is used. A program graph representation is derived from the branch operations with activity represented on the nodes and control sequences defined by the edges. The graph is segmented into areas using a distance matrix. Reviewing optimization techniques from compilers, techniques of graphical analysis, resource assignment, code motion, redundant operations, negated effects, parallelism, and data forwarding are selected for microprogram application. Dissert. Abstr.

N77-13692 Virginia Univ., Charlottesville.
PARALLEL ALGORITHMS IN CELLULAR SPACES Ph.D. Thesis
Frances Lucretia VanScoy 1976 271 p
Avail: Univ. Microfilms Order No. 76-24997

A modification of von Neumann's cellular automation system is studied as a model for parallel processing. A rectangular two dimensional array of identical finite processors interconnected in such a way that each can examine the contents of the registers of its four immediate neighbors is used. Time is discrete, and within each time interval the value of each register changes based on the values of the registers in the same and the four neighboring processors. Several parallel algorithms which use O(to sq n power) processors and are between O(log n) and O (to n to the 1.7 power) faster than the best known sequential algorithms are presented. The mean percentage of time spent by a processor performing computational or bookkeeping work or idling is computed for the major algorithms. Dissert. Abstr.

N77-13693 Delaware Univ., Newark.
A UNIFIED TREATMENT OF GRAPH THEORETIC MODELS FOR PARALLEL COMPUTATION Ph.D. Thesis
Ann Toni Cohen 1976 222 p
Avail: Univ. Microfilms Order No. 76-24236

The sequential marked graph, an extremely flexible model for depicting the flow of control through parallel processes is introduced. The representation is intended to serve as a unifying model, through which other, not directly comparable, graph formulations may be connected. Mappings are defined from the classes of computation graphs, graphs and parallel flowchart control graphs to the set of smg's and are shown to be monomorphisms. These mappings are shown to be generally invertible and their inverses are defined. Dissert. Abstr.

N77-13694 Wisconsin Univ., Madison.
THE APPLICATION OF DISCRETE PROGRAMMING TECHNIQUES IN THE STRUCTURAL OPTIMIZATION Ph.D. Thesis
Mehmet Rifat Saglam 1976 254 p
Avail: Univ. Microfilms Order No. 76-18903

To implement the method, three computer programs, one for the optimization of trusses and two for the optimization of frames were written. In the truss optimization, elastic design criteria are used. The structural formulation of the problem is derived using the matrix displacement or stiffness method. The optimization procedure is constructed for the minimization of the total volume of the structure, and stress and deflection limitations were used to obtain the primary constraints. The optimum continuous solution of the linear optimization is assumed as a starting point for the discrete search. Consequently, the size of the discrete program has been reduced considerably. Several different approaches have been presented to reach the optimal discrete solution and their computational efficiency was investigated. In the frame optimization problem, plastic design criteria is used. The optimization problem is constructed for the minimization of the total weight of the structure. Dissert. Abstr.

N77-13695*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
GENERALIZED EC&LSS COMPUTER PROGRAM CONFIGURATION CONTROL Final Report
R. L. Blakely Nov. 1976 34 p refs
(Contract NAS9-14877)
(NASA-CR-151121; MDC-G6598) Avail: NTIS HC A03/MF A01 CSCL 09B

The generalized environmental control and life support system (ECLSS) computer program (G189A) simulation of the shuttle orbiter ECLSS was upgraded. The G189A component model configuration was changed to represent the current PV102 and subsequent vehicle ECLSS configurations as defined by baseline ARS and ATCS schematics. The diagrammatic output schematics of the gas, water, and freon loops were also revised to agree with the new ECLSS configuration. The accuracy of the transient analysis was enhanced by incorporating the thermal mass effects of the equipment, structure, and fluid in the ARS gas and water

loops and in the ATCS freon loops. The sources of the data used to upgrade the simulation are: (1) ATCS freon loop line sizes and lengths; (2) ARS water loop line sizes and lengths; (3) ARS water loop and ATCS freon loop component and equipment weights; and (4) ARS cabin and avionics bay thermal capacitance and conductance values. A single G189A combination master program library tape was generated which contains all of the master program library versions which were previously maintained on separate tapes. A new component subroutine, PIPETL, was developed and incorporated into the G189A master program library. S.M.

N77-13696*# Houston Univ., Tex. Dept. of Mathematics.
USER'S GUIDE: DATEXT
William A. Coberly, Jack D. Tubbs, and Larry Hinman Aug. 1976 33 p
(Contract NAS9-15000)
(NASA-CR-151133; Rept-58) Avail: NTIS HC A03/MF A01 CSCL 09B

A guide is presented for a computer program which reads multispectral scanner data from a universal format tape and outputs an intermediate data set in card image format for use as an input data set in various data analysis development programs. Author

N77-13697*# M&S Computing, Inc., Huntsville, Ala.
IMPLEMENTATION OF LARGE SCALE INTEGRATED (LSI) CIRCUIT DESIGN SOFTWARE Final Report
R. L. Kuehlthau and E. R. Pitts 16 Sep. 1976 24 p refs
(Contract NAS8-31358)
(NASA-CR-150069; Rept-76-0041) Avail: NTIS HC A02/MF A01 CSCL 09B

Portions of the Computer Aided Design and Test system, a collection of Large Scale Integrated (LSI) circuit design programs were modified and upgraded. Major modifications were made to the Mask Analysis Program in the form of additional operating commands and file processing options. Modifications were also made to the Artwork Interactive Design System to correct some deficiencies in the original program as well as to add several new command features related to improving the response of AIDS when dealing with large files. The remaining work was concerned with updating various programs within CADAT to incorporate the silicon on sapphire silicon gate technology. Author

N77-13698# Naval Underwater Systems Center, New London, Conn.
FORTRAN PROGRAM FOR MULTIVARIATE LINEAR PREDICTIVE SPECTRAL ANALYSIS, EMPLOYING FORWARD AND BACKWARD AVERAGING
Albert H. Nuttall 19 May 1976 25 p refs
(NUSC Proj. A-752-05; NUSC Proj. A-600-00)
(AD-A024982; NUSC-TD-5419) Avail: NTIS HC A02/MF A01 CSCL 09/2

A FORTRAN program for multivariate linear predictive spectral analysis, employing forward and backward averaging, is presented. The program is written for general M, where M is the number of processes, with the exception of an internal function and three internal subroutines which are written for M = 2 in this version of the program, but can easily be generalized to generalize it. The presented program generalized Burg's algorithm to the multivariate case. GRA

N77-13699# University of Southern Calif., Los Angeles. Dept. of Pathology.
MONTE CARLO RESULTS FROM A COMPUTER PROGRAM FOR TAILORED TESTING
Robert A. Cudeck, Norman Cliff, Thomas J. Reynolds, and Douglas J. McCormick Feb. 1976 43 p refs
(Contract N00014-75-C-0684; RR0420401; NR Proj. 150-373)
(AD-A025011; TR-2) Avail: NTIS HC A03/MF A01 CSCL 09/2

INTERTAIL, the computer program which implements an approach to tailored testing outlined by Cliff (1975), was examined with errorless data in several Monte Carlo studies. Three replications of each cell of a 3 x 3 table with 10, 20 and 40 items and persons were analyzed. Mean rank correlations coefficients between the true order, specified by pre-assigned random numbers, and the computed order produced by the program ranged from .93 to .99. Other efficiency measures are reported which also support the theory as a general measuring and ordering technique. Based on these results, program modifications are proposed as well as a data scheme which is to be used in further system testing. Author (GRA)

N77-13700# California Univ., Davis. Water Science and Engineering Section.
COMPUTER PROGRAM FOR THREE-DIMENSIONAL PLOTTINGS FROM IRREGULAR FINITE ELEMENT GRID
Sumant K. Gupta, Michael W. Morrisey, John Lonczak, and Kenneth K. Tanjii Mar. 1976 23 p refs
(PB-256568/7; Paper-4010; W76-11327; UCAL-WRC-W-438)
Avail: NTIS HC A02/MF A01 CSCL 08H

Computer programs have been developed to interpolate the data from an irregular finite element grid such that three-dimensional plottings can be generated to depict results from two or three dimensional finite element solution. The program developed has the option of generation of plots as viewed from various angles, varying number of contours and vertical scale. The capabilities of this program are illustrated by using specific examples of a finite element solution for groundwater flow, Sutter Basin, California. GRA

N77-13701# Stanford Univ., Calif. Systems Optimization Lab.
DESIGN OF A LINEAR PROGRAMMING SYSTEM FOR THE ILLIAC 4
C. E. Pfefferkorn and J. A. Tomlin Apr. 1976 90 p refs
(Contracts N00014-75-C-0865; DAAC29-74-C-0034; E(04-3)-326; Grant NSF DCR-75-04544; NR Proj. 047-143)
(AD-A027440; SU-SOL-76-8; ARO-12215.11-M) Avail: NTIS HC A05/MF A01 CSCL 12/1

This paper outlines a design for implementing a linear programming system on the ILLIAC IV computer. The central concern is to take advantage of the special features of the ILLIAC IV (64 parallel processing elements, large fast disk memory and relatively small fast core memory) and at the same time to take advantage of the sparsity of real large-scale linear programs and the (mostly serial) methodology which has been developed to exploit this sparsity. This requires both the adaption of existing techniques to a parallel environment and the development of a new parallel techniques for efficient sparse matrix processing. It appears that this can be done successfully and that ILLIAC IV should be able to solve problems considerably larger than those which can be attempted on serial computers. Author (GRA)

N77-13702# Stanford Univ., Calif. Digital Systems Lab.
FEASIBILITY OF REAL TIME EMULATION Final Report
Michael J. Flynn Nov. 1975 11 p refs
(Grant AF-AFOSR-2865-75; AF Proj. 9769)
(AD-A025206; SU-TN-70; AFOSR-76-0541TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This project has studied several alternate methods for the realization of high performance emulation. High performance or real-time emulation occurs when a host machine is able to interpret the instructions of another machine (called the image machine) in the same time as that machine would have executed the same set of instructions. Occasionally such interpretation occurs at an even faster rate than the original image machine. We label this phenomenon hyper-real-time emulation. Several organizations have been studied as well as organizational extensions to our present EMMY organization. The most promising structures that we have developed are extensible, over-lapped processors. An independent, order of magnitude, performance improvement is available through other techniques called directly executed languages. Author (GRA)

N77-13703# City Univ. of New York.
TABLE, A PL-1 PROGRAM FOR COMPUTING CERTAIN INTEGRALS OF THE PRODUCT OF THREE LEGENDRE POLYNOMINALS USEFUL IN COMPUTING THE BUCKLING OF THIN WALLED SPHERICAL STRUCTURES Interim Report
Harry E. Rauch, Neal H. Jacobs, and Jonathan L. Marz 1975 75 p

(Grant AF-AFOSR-2063-71; AF Proj. 9749)
(AD-A025101; AFOSR-76-0552TR) Avail: NTIS
HC A04/MF A01 CSCL 20/11

TABLE, a PL/1, double precision program, supplies coefficients for the equations solved by SPHERE, which is the program that does the computation for instability of thin-walled spherical structures under external pressure. GRA

N77-13704# Maryland Univ., College Park. Computer Science Center.
PATTERN ANALYSIS, MODELING AND CLASSIFICATION Final Report, 1 Sep. 1970 - 31 Aug. 1975
Laveen Kanal 31 Aug. 1975 55 p refs
(Grant AF-AFOSR-1982-71)
(AD-A025207; AFOSR-76-0600TR) Avail: NTIS
HC A04/MF A01 CSCL 09/2

General purpose techniques for pattern analysis, modeling and classification are being developed at the Laboratory for Pattern Analysis of the University of Maryland under the sponsorship of the Air Force Office of Scientific Research. These techniques are being applied to practical problems in digital communications, computers, and the machine recognition of spatial and temporal patterns in waveforms and images derived from sensors. The objective of this effort is to enable more efficient use of existing data communications and computer equipment, permit the design of superior communications networks, provide better methods for the automatic and semi-automatic classification of sensor data, and allow more natural man-machine communication by enabling natural input to computers, of chemical structure diagrams, displayed mathematical expressions and other such two dimensional line drawings. GRA

N77-13705# PRC Information Sciences Co., Rome, N.Y.
ANALOG TO DIGITAL GRAPHIC CONVERSION Final Report, Jun. 1974 - Dec. 1975
Richard Conti and Gary W. Virkler May 1976 245 p refs
(Contract F30602-74-C-0348; AF Proj. 5569)
(AD-A026137; RADC-TR-76-149) Avail: NTIS
HC A11/MF A01 CSCL 08/2

A primary concern in the development of the Advanced Cartographic System is the application of the raster-scanning technology to the process of digital data collection. This report describes methods developed which determine the feasibility of linealizing raster scanned data with the aid of coarsely tracked lineal files and the practicability of developing an evaluation matrix directly from the raster format of a scanned color-coded contour manuscript. Software developed under this effort was intended mainly for demonstration purposes and further refinement will be required for an efficient production system. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N77-13706 Ohio State Univ., Columbus.
DESIGN AND OPERATIONS OF A SECURE COMPUTER SYSTEM Ph.D. Thesis
Sead Muftic 1976 197 p
Avail: Univ. Microfilms Order No. 76-24657

The main components of the system and its operation to be protected are communications with remote users, data transmission, processing, storage and retrieval, and multilevel sharing of computer information. Security in the system was achieved by a unified application of cryptography and access control combined with some special procedures which improve either the security of the system or its operational efficiency. Cryptographic protection in the communication system (user identification, user authentication, data transmission) is implemented with a special encoding/decoding device at each terminal. That device encodes data coming from the terminal and decodes data coming from the central site. Cryptographic protection in main memory, on external files and during processing of data is provided by the security control device which is placed between main memory and the CPU. Dissert. Abstr.

N77-13707 Stanford Univ., Calif.
ERROR RECOVERY AND PROCESS COMMUNICATION Ph.D. Thesis
David Lewis Russell 1976 244 p
Avail: Univ. Microfilms Order No. 76-26071

The relationship of error recovery in a computer system to the structure of the primitives used to implement inter-process communication is discussed. Two models are studied: (1) the producer-consumer system written in extended PASCAL; and (2) a general asynchronous system of processes with message lists and SEND-RECEIVE primitives for inter-process communication. The domino effect is also examined. Dissert. Abstr.

N77-13708 Nebraska Univ., Lincoln.
CONTROLLABILITY OF NONLINEAR SYSTEMS Ph.D. Thesis
Robert Daniel Gahl 1976 80 p
Avail: Univ. Microfilms Order No. 76-25868

Theorems are established which guarantee either complete or local controllability of various nonlinear systems. Several applications are also obtained. Dissert. Abstr.

N77-13709 Illinois Univ., Urbana-Champaign.
ON A COMPUTER SYSTEM FOR PLANNING AND EXECUTION IN INCOMPLETELY SPECIFIED ENVIRONMENTS
Steven Jay Weissman 1976 167 p
Avail: Univ. Microfilms Order No. 76-24204

Problems associated with operating in domains which are not completely specified at the time of initial planning are considered. One of the major problems is how to satisfy goals when some possibly relevant information is unknown. A method for deferring detailed planning to satisfy goals until a later time when new information becomes available is discussed. The plans which are produced take the form of outlines which specify the major actions which have to be executed. As new information is obtained, additional operations are added to the plan, filling in details of the outline. Problems involved with how to determine whether information is missing as well as how to obtain the information are discussed. In this system, an attempt is made to relax the distinction between planning and execution phases. Dissert. Abstr.

N77-13710 Virginia Polytechnic Inst. and State Univ., Blacksburg.
STABILITY OF INPUT-OUTPUT SYSTEMS WITH OPTIMIZED SUBSYSTEMS Ph.D. Thesis
Induk Douglas Moon 1976 131 p
Avail: Univ. Microfilms Order No. 76-24335

An investigation is reported of the pattern of the structural change in an input/output system, when one or more of its subsystems are operationally optimized. Only the output side is analyzed for both the static and dynamic systems. By operationally optimizing a sector, a production process is selected in such a way that the input (and the capital in a dynamic system) requirement from each of the sectors in the economy does (not) exceed some percent of the equilibrium level as specified by the input-output economy. It is concluded that under all the normal assumptions a static input/output system does reach a stable state if the optimization is performed through linear programming. For a dynamic system, some conditions are developed for the system to reach such a state. Dissert. Abstr.

N77-13711 Delaware Univ., Newark.
GLOBAL CONSIDERATIONS IN THE DESIGN OF MULTI-HOST COMPUTER NETWORKS Ph.D. Thesis
Daniel James Grim 1976 92 p
Avail: Univ. Microfilms Order No. 76-24258

The design considerations which impact the development of a transparent network are reviewed. Transparency is defined to mean that the operation of the network would make it indistinguishable from that of a contemporary timesharing system. Justifications are presented which show that unless a network is developed in this way, it is only useful to a very small subset of its users. An implementation strategy is developed which makes it possible to build such a network. The process of development is shown to fall into two major phases: development of a value added network and superposition of a network operating system on that substructure. The implementation of the value added network is shown to be especially critical to the overall goals

since most of the network operating system support capabilities are imbedded in that software. Dissert. Abstr.

N77-13712 George Washington Univ., Washington, D.C.
TOPOLOGY CONSIDERATIONS FOR LOCAL COMPUTER NETWORKS Ph.D. Thesis
Terry Leo Collins 1976 191 p
Avail: Univ. Microfilms Order No. 76-21764

Topological structure for message switched store-and-forward local computer networks are evaluated in terms of mean message delay and network reliability. Bounds on mean message delay for networks with M identical links and N nodes are found and a new reliability measure is introduced and used for network comparison. The key parameters affecting message delay in a computer network are discussed and a network model is developed. The model assumes Poisson arrivals and independent identically distributed message lengths at each of the channels in the network. Computer network topologies for achieving highly reliable networks are also considered. Deterministic and probabilistic reliability measures are reviewed, and some procedures for numerical evaluation are given. Dissert. Abstr.

N77-13713# California Univ., Livermore. RISOS Project.
SECURITY ANALYSIS AND ENHANCEMENTS OF COMPUTER OPERATING SYSTEMS Final Report, Jul. 1974 - Dec. 1975
R. P. Abbott, J. S. Chin, J. E. Donnelley, W. L. Konigsford, S. Tokubo, and D. A. Webb Apr. 1976 70 p refs
(Contract NBS-S-413558-74; ARPA Order 2166)
(PB-257087/7; NBSIR-76-1041) Avail: NTIS HC A04/MF A01 CSCL 09B

Three commercial operating systems are analyzed, and security enhancements suggested. Because of the similarity of operating systems and their security problems, specific security flaws are formally classified according to a taxonomy developed here. This classification leads to a clearer understanding of security flaws and aids in analyzing new systems. The discussions of security flaws and the security enhancements offer a starting reference for planning a security investigation of an EDP installation's operating system. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N77-13714# Institut fuer Informationsverarbeitung in Technik und Biologie, Karlsruhe (West Germany).
QUANTITATIVE STUDY ON PREPROCESSING TECHNIQUES FOR THE RECOGNITION OF HANDPRINTED CHARACTERS
Alwin Guedesen Bonn DOKZENTBw 1975 172 p refs In GERMAN; ENGLISH summary
(Contract T/RF-34/RF-340/21269)
(BMVg-FBWT-75-27) Avail: NTIS HC A08/MF A01; DOKZENTBw DM 40

Preprocessing is here defined as the performance of transformations on digitized characters. A clear distinction is made between preprocessing and feature selection. The developed techniques were tested within a recognition system based on series expansion for systematic feature selection and classifies characters by means of a Bayes decision rule. Both local operations and global techniques were investigated. The reduction of error rate was used as a quantitative measure of efficiency for the different methods. Low cost figures of merit were also developed and their use as criterion investigated. The use of class dependent preprocessing techniques was examined in order to increase the efficiency of error correcting second stage classifiers. All results are based on experiments with large, representative character samples and can be regarded as reliable in a statistical sense. Author (ESA)

N77-13715# Institut fuer Informationsverarbeitung in Technik und Biologie, Karlsruhe (West Germany).
THE IITB PATTERN RECOGNITION CONCEPT. THEORY AND APPLICATION TO HANDWRITTEN NUMBERS, PRINTED- AND SPECIAL CHARACTERS [DAS IITB-MUSTERERKENNUNGSKONZEPT. THEORIE UND ANWENDUNG AUF HANDGESCHRIEBENE ZIFFERN, DRUCKBUCHSTABEN UND SONDERZEICHEN]
G. Winkler Bonn DOKZENTBw 1976 109 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-76-4) Avail: NTIS HC A06/MF A01; DOKZENTBw DM 40

A statistical-analytical procedure was applied to the recognition of handwritten numerals, handprinted letters, and special characters given as binary quantized image matrices. Classification experiments were carried out first with a small-size sample of patterns (100 patterns per class), then with a medium-size sample (560 patterns per class), and finally with a large-size sample (3,000 patterns per class). The early results were improved by such measures as the refinement of resolution from 9 x 14 elements in a picture matrix to 16 x 20 elements, numerous procedures of preprocessing, postprocessing in correction systems, and the introduction of rejection. The effectiveness of these measures is shown in numerous diagrams. Author (ESA)

N77-13716# European Space Agency, Paris (France).
IMAGE PROCESSING BY COMPUTER
Guy Hanuise Oct. 1976 45 p refs Transl. into ENGLISH of 'Le Traitement des Images par Ordinateur', ONERA, Paris Report ONERA-NT-1975-10, 1975
(ESA-TT-322; ONERA-NT-1975-10) Avail: NTIS HC A03/MF A01

The great increase in the role of the image, considered as a two-dimensional set of points containing information, poses various problems to do with coding prior to transmission, filtering, image reconstitution, and information selection. Digital methods can be used for these various processing stages. Possibilities offered in this field by orthogonal transformations with a fast computation algorithm are discussed. An analysis of the volume of information contained in an image and its reduction, with minimum possible loss, leads to the Karhunen-Loeve transformation, which is optimum in the least squares sense. The complexity of the calculations associated with this transformation necessitated the use of orthogonal transformations which are more easily handled on a computer of the fast algorithm type. The properties of the three main transformations (Fourier, Hadamard, Haar) are summarized briefly. Some simple examples of computer processing are: effect of quantification of a digital hologram of image reconstitution, convolution of two images, matched filtering, and pattern recognition, which are special properties of the Haar transformation. Results obtained in the broader field of digital simulation of physical systems are presented. Author (ESA)

N77-13717# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Regelungssysteme.
DESIGN OF LINEAR CONTROL LAWS AND REDUCED ORDER MODELS BY MINIMIZING A QUADRATIC COST FUNCTIONAL Ph.D. Thesis - Tech. Univ. Hannover
Winfried Hofmann 19 Jul. 1976 112 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-340)
(DLR-FB-76-39) Avail: NTIS HC A06/MF A01; DFVLR, Cologne, DM 43,50

The formulation of the design of linear control laws and reduced-order models using a quadratic cost functional represents an advantageous set-up which permits influencing the behavior of certain variables and leads to numerically suitable solution procedures. Design procedures of linear control laws for higher order systems and for given stability constraints were derived. The design of reduced-order models includes known initial conditions and inputs with known autocorrelation-function. Author (ESA)

N77-13718# Louisiana State Univ., Baton Rouge. Dept. of Computer Science.
STUDIES IN OPTIMAL CONTROL, ESTIMATION AND LINEAR SYSTEMS THEORY Progress Report
Cecil L. Smith and Armando B. Corripio 31 Dec. 1975 17 p

(Contract AF-AFOSR-2580-74; AF Proj. 9769)
(AD-A025126; AFOSR-76-0561TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Contents: design of sub-optimal controllers for systems excited by unmeasured external disturbances; model reference adaptive control of nonlinear sampled data systems; estimation of unmeasured states in systems subject to non-zero mean external disturbances; the effect of a generalized numerator polynomial on multivariable control system response.

Author (GRA)

N77-13719# Brown Univ., Providence, R. I. Lefschetz Center for Dynamical Systems.

NUMERICAL SOLUTIONS OF HEREDITARY CONTROL PROBLEMS VIA AN APPROXIMATION TECHNIQUE Interim Report

H. T. Banks, J. A. Burns (Virginia Polytechnic Institute and State Univ.), E. M. Cliff (Virginia Polytechnic Institute and State Univ.), and P. R. Thrift (Brown Univ.) Oct. 1975 106 p
(Grants AF-AFOSR-2078-71; NSF GP-28931; AF Proj. 9769)
(AD-A027756; CDS-TR-75-6; AFOSR-76-0855TR) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report discusses in some detail, numerical results for certain hereditary optimal control problems. The numerical procedures involved are based on the approximation ideas proposed by Banks and Burns. The resulting method is easy to implement and in most cases the convergence of approximate solutions to the actual solutions is quite good. Attention here is restricted to control problems with quadratic payoffs. (Somewhat more general payoffs and linear systems could have been treated.) The main reason for this is the case in demonstrating the computational feasibility of the method. Indeed, for the integral quadratic cost problem treated here the approximate control problem becomes a finite dimensional linear regulator problem which is easily solved numerically via standard techniques. In Section 2 a brief description of the problem and our method is given. Section 3 contains a number of examples which are solved exactly using the maximum principle, and in Section 4 representative numerical details for approximate solutions of these examples along with numerical results for several other examples are presented. GRA

N77-13720# Illinois Univ., Urbana-Champaign. Coordinated Science Lab.

ON OPTIMAL CONTROL PROBLEMS WITH STATE-VARIABLE INEQUALITY CONSTRAINTS

Albert Lewis Hendricks May 1976 98 p refs
(Contract DAAB07-72-C-0259; Grant AF-AFOSR-2570-73)
(AD-A027277; R-727; UILU-ENG-76-2215) Avail: NTIS HC A05/MF A01 CSCL 12/1

The state-variable inequality constrainted optimal control problem is considered. The problem is formulated as a standard optimal control problem with one additional constraint of the form S(x(t)) less than or equal to 0. This constraint is assumed to be of p-th order where p is an integer and p greater than or equal to 1. In particular, the p-th time derivative of the constraint is the first to contain the control variable explicitely. GRA

N77-13721# Technology Service Corp., Santa Monica, Calif.

ADAPTIVE PROCESSING EXPERIMENT (APE) PHASE 2 Final Technical Report, Jun. - Dec. 1975

J. Bailey, J. Mallet, B. Whitehead, A. Katz, and T. Boak Griffiss AFB, N. Y. RADC May 1976 247 p
(Contract F30602-75-C-0264; AF Proj. 414L)
(AD-A027071; RADC-TR-76-130) Avail: NTIS HC A11/MF A01 CSCL 09/4

The impact of receiver passband phase and amplitude error on the RMS sidelobes of a digital beamforming system is analyzed. A method is developed whereby a digital transversal filter is used on the output of each receiver prior to beamforming to minimize the error in a LMS sense. The method is applied to an OTH radar system and results given. With a 16-tap filter the receivers error is reduced from -35 dB to -63 dB. Additionally, a method of calibrating an H. F. receive array by the use of a known near-field source is illustrated. Results are shown for the performance of the calibrated array against OTH sources using conventional and adaptive beamforming techniques. Discrimination of better than 40 dB is illustrated for an OTH signal source 2,000 miles from the array. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N77-13722 George Washington Univ., Washington, D.C.

STABILITY AND RELATIVE STABILITY OF LINEAR SYSTEMS WITH MANY CONSTANT TIME DELAYS Ph.D. Thesis

Larry Keith Barker 1976 108 p
Avail: Univ. Microfilms Order No. 76-23964

This technique, an extension of the tau decomposition method, is used to examine not only the stability but also the relative stability of retarded systems with many delays and of a class of neutral equations with one delay. Analytical equations are derived for partitioning the delay space of a retarded system with two time delays. The stability of the system in each of the regions defined by the partitioning curves in the parameter plane is determined using the extended tau decomposition method. In addition, relative stability boundaries are defined using the extended tau decomposition method in association with parameter plane techniques. Several applications of the extended tau decomposition method are presented and compared with stability results obtained from other analyses. In all cases, the results obtained using the method outlined herein coincide with and extends those of previous investigations. Dissert. Abstr.

N77-13723 Emory Univ., Atlanta, Ga.

FINITE EQUATIONALLY COMPLETE ALGEBRAS IN CONGRUENCE PERMUTABLE VARIETIES Ph.D. Thesis

Bruce Randolph Caine 1976 70 p
Avail: Univ. Microfilms Order No. 76-25068

The structure and properties of finite equationally complete algebras in congruence permutable varieties are discussed. Particular attention is given to finite equationally complete quasigroups. Most of the results given for quasigroups are also given for algebras in any congruence permutable variety. Dissert. Abstr.

N77-13724 Virginia Univ., Charlottesville.

DYER-LASHOF OPERATIONS AND BORDISM Ph.D. Thesis

Rollie Michael Alliston 1976 58 p
Avail: Univ. Microfilms Order No. 76-24998

External geometric operations in unoriented bordism are introduced. In particular they satisfy a Cartan type formula. These operations are shown to cover the Dyer-Lashof operations in homology with Z sub 2 coefficients. Examples are exhibited of odd-dimensional, orientable, nonbounding, line element parallelizable manifolds which represent indecomposable elements in the torsion part of the oriented bordism ring. Dissert. Abstr.

N77-13725 Princeton Univ., N.J.

THE MOTION OF A SURFACE BY ITS MEAN CURVATURE Ph.D. Thesis

Kenneth Allen Brakke 1975 90 p
Avail: Univ. Microfilms Order No. 76-23800

Intuitively, a time-varying k-dimensional surface in R sup n is moving by its mean curvature if the velocity of each point is equal to the mean curvature vector of the surface at that point. Such motion in general dimensions was studied in the context in of geometric measure theory; the surfaces were considered to be varifolds. An evolution by mean curvature motion was constructed for very general initial surfaces for all positive time. If the initial surface is a smooth closed submanifold of R sup n and for some time has a uniformay smooth evolution according to the differential geometric notion of flow by mean curvature, then the two evolutions agree during this time. The characteristic property of motion by mean curvature and conditions for any time varying surface having this property are given. Dissert. Abstr.

N77-13726 Texas Univ., Austin.
THE RANDOM-PHASE APPROXIMATIONS, LINEAR POLYENES, AND RETINAL Ph.D. Thesis
Bryan Leonard Bartlett 1976 149 p
Avail: Univ. Microfilms Order No. 76-26592

There exist several methods for obtaining approximate solutions to large many-body Hamiltonians. Both the traditional random-phase approximation (RPA) and spectrum generating hypervirial theory (HVT) are constructed in the unitary group formalism of the many-body problem. It is demonstrated that the former is actually a special case of the latter. The higher random-phase approximation (Rowe's method) will also be discussed from the hypervirial standpoint. The results of RPA and HVT calculations are compared with complete CI calculations for three model Hamiltonians, and the usefulness of each method for estimating excitation energies and oscillator strength are discussed. Applications to the retinal problem are also discussed. Dissert. Abstr.

N77-13727 Stevens Inst. of Tech., Hoboken, N.J.
AN EXTENSION OF THE INVERSE FUNCTION THEOREM Ph.D. Thesis
Roberto Macchia 1975 182 p
Avail: Univ. Microfilms Order No. 76-25166

The study of the local invertibility of a continuously differentiable function in the case when f(j) (x sub 0) equals o, j less than or equal to k-1 and greater than or equal to o, and f(k) (x sub o) not equal to o for some positive integer k. The main result consists in establishing the analytic properties of the inverse function in relation to the differentiability properties of the function. To accomplish this aim, an extensive preliminary study of the properties of roots of differentiable functions is made. An application of the generalized Inverse Function Theorem to the study of the asymptotic behavior of certain Fourier integrals is shown. The result thus obtained cannot be obtained by usual methods. Dissert. Abstr.

N77-13728 Iowa Univ., Iowa City.
THE APPROXIMATE SOLUTION OF VOLTERRA INTEGRAL EQUATIONS OF THE SECOND KIND Ph.D. Thesis
James Edward Logan 1976 220 p
Avail: Univ. Microfilms Order No. 76-26308

Numerical procedures for Volterra integral equations of the second kind are examined. The essential concepts and the existing literature are reviewed. Questions of defining a best approximation, the conditions for its existence, and procedures for its determination are explored. The manner in which Volterra equations arise in practice is illustrated by considering a problem in the theory of heat transfer of a composite solid under a nonlinear boundary condition. Dissert. Abstr.

N77-13729 Fordham Univ., New York.
ON RIEMANN SURFACES WITH DIHEDRAL GROUP OF AUTOMORPHISMS Ph.D. Thesis
Fou-Lai Lin 1976 60 p
Avail: Univ. Microfilms Order No. 76-25733

Attempts are made to characterize in an intrinsic way the embeddable dihedral groups of a compact Riemann surface.
Dissert. Abstr.

N77-13730 Oklahoma Univ., Norman.
GENERALIZED CONVEXITY STRUCTURES AND THEIR PRODUCTS Ph.D. Thesis
John William Legge 1976 67 p
Avail: Univ. Microfilms Order No. 76-24366

A generalized convexity structure is defined to be an ordered pair (X, zeta) such that X is a nonempty set and zeta is a collection of subsets of X such that a) X and phi are members of zeta and b) zeta is closed under intersections. It is shown that some of the results of classical convexity theory are valid in this generalized setting. Results concerning the Caratheodory and Helly numbers in this product are obtained. Another method of defining the product of two generalized convexity structures is given and results concerning the Caratheodory and Radon numbers are obtained. A definition using linear projections is given for the product of two generalized convexity structures when the underlying sets are vector spaces. Dissert. Abstr.

N77-13731 Drexel Univ., Philadelphia, Pa.
STABILITY PROPERTIES IN CONTINUOUS LEAST SQUARES AND DISCRETE MINIMUM VARIANCE SMOOTHING OPERATIONS Ph.D. Thesis
Leo William Lampone 1976 81 p
Avail: Univ. Microfilms Order No. 76-22417

Certain stability properties of smoothing methods for both continuous and discrete data are considered. The smoothing of continuous data is accomplished by a convolution integral operation with respect to a distribution function on a symmetric interval, such that polynomials of specified degree are preserved. Classes of stable smoothing formulas are generated by utilizing some recently proved properties of orthogonal polynomial expansions. Discrete data are smoothed by application of a finite, symmetric moving average which also preserves polynomials of specified degree and which minimizes the variance of the difference of smoothed value and expected value. This is accomplished by matching the smoothing operation to the anticipated error in the data. It is shown how such minimum variance smoothing operations, when stable, give rise to rather broad classes of stable smoothing formulas. A generalization of the classical concept of orthogonal polynomials is derived.
Dissert. Abstr.

N77-13732 Fordham Univ., New York.
ON SEGAL ALGEBRAS AND A-SEGAL ALGEBRAS Ph.D. Thesis
Tsing-jen Ho 1976 87 p
Avail: Univ. Microfilms Order No. 76-25726

Problems coming from Segal algebras such as approximate identities, canonical correspondence, non-factorizations, and characterizations are studied. A general definition of boundedness is introduced and it is proved that a weak approximate identity bounded in the operator norm is also a strong approximate identity. Every A-Segal algebra and its containing Banach algebra have the same structure space. The concept of derived Segal algebras is defined via Hewitt's factorization theorem. Using it as a tool, various characterizations of Segal algebras are established.
Dissert. Abstr.

N77-13733 Fordham Univ., New York.
ON GROWTH PROPERTIES OF SOLUTIONS OF ALGEBRAIC DIFFERENTIAL EQUATIONS Ph.D. Thesis
Beatrice Eva Eastman 1976 48 p
Avail: Univ. Microfilms Order No. 76-25721

Two cases are presented concerning the growth of the solutions of nth order algebraic differential equations. It is shown that an entire function which is the solution of an nth order algebraic differential equation satisfying the coefficient condition can be estimated by O(expn r to the A power) where expn is the nth iterate of the exponential function and A greater than or equal to 0. Dissert. Abstr.

N77-13734 Emory Univ., Atlanta, Ga.
ALGEBRAS WITH A MODULAR SUBALGEBRA LATTICE Ph.D. Thesis
Donald Richard Peeples 1976 72 p
Avail: Univ. Microfilms Order No. 76-25077

A ring (algebra) whose subring (subalgebra) lattice is modular is here called an M-ring (M-algebra). Two important steps are presented in the classification of M-rings. Torsion-free nil M-rings and M-rings K satisfying pK equals zero, 2 not equal to p(prime) are characterized. Also characterized are semiprime M-algebras and nil-M-algebras over fields of characteristic not equal to 2. The structure theory for M-algebras in terms of nil M-algebras and M-algebras that are division rings is discussed. Nil M-algebras over fields of characteristic 2 are analyzed along with a brief examination of division M-algebras. Dissert. Abstr.

N77-13735 Brandeis Univ., Waltham, Mass.
NATURAL VECTOR BUNDLES AND NATURAL DIFFERENTIAL OPERATORS Ph.D. Thesis
Chuu-Lian Terng 1976 92 p
Avail: Univ. Microfilms Order No. 76-25328

It is a classical problem in differential geometry to classify geometric objects and invariant differential operators. A natural vector bundle over smooth n-manifolds is a functor F from the category of smooth n-manifolds, with embeddings as morphisms,

to the category of smooth vector bundles, with vector bundle maps as morphisms. The most well known examples of natural vector bundles are tensor bundles, k-jet bundles of tensor bundles, and direct summands of tensor products of these bundles.
Dissert. Abstr.

N77-13736 Brandeis Univ., Waltham, Mass.
REPRESENTATION THEORY OF ALGEBRAS STABLY EQUIVALENT TO AN HEREDITARY ARTIN ALGEBRA Ph.D. Thesis
Maria Ines Platzeck 1976 68 p
Avail: Univ. Microfilms Order No. 76-25152

An Artin algebra is an Artin ring having the property that its center C is an Artin ring and mod is a finite generated module over C. Let mod be the category of finitely generated left mod modules. The category mod of finitely generated mod-modules modulo projectives is the category whose objects are the finitely generated mod-modules and where the set of morphisms Hom mod (A,B) between two objects A and B in mod is the C-module Hom mod (A,B)/P(A,B), where P(A,B) is the C-submodule of Hom mod (A,B) consisting of all morphisms from A to B that factor through a projective module. The results obtained on the characterization of hereditarily locally connected continua generalize theorems which were proven in the metric setting. Properties of Hausdorff spaces which are obtainable as continuous images of totally ordered compacta are established.
Dissert. Abstr.

N77-13737 Rochester Univ., N.Y.
CONVERGENT PERTURBATIVE AND ITERATIVE METHODS APPLIED TO THE DUFFING EQUATION AND ANHARMONIC OSCILLATOR SYSTEMS Ph.D. Thesis
Charles Russell Eminhizer 1976 270 p
Avail: Univ. Microfilms Order No. 76-23988

A method for solving the dynamics of systems of extremely nonlinear coupled anharmonic oscillators with polynomial force laws is demonstrated. Several convergent perturbative and iterative techniques are described and applied, yielding the Fourier frequencies and coefficients of the time dependent solution. The usual stumbling block in a series analysis of coupled nonlinear systems is the appearance of terms with arbitrarily small denominators resulting in a rapidly divergent series. This classic small denominators problem is avoided by concentrating on the periodic solutions of a system. The poincare recurrence time (Tr) of a system is employed as the period of the solution, i.e., each Fourier frequency can be expressed as n(2 pi/Tr), with some integer n. The solutions with rationally dependent Fourier frequencies are constructed whereas the Kolmogorov-Arnold-Moser theorems demonstrate the existence of certain solutions whose frequencies are rationally independent. Dissert. Abstr.

N77-13738 Wayne State Univ., Detroit, Mich.
DISSIPATION IN LAGRANGIAN-HAMILTONIAN DYNAMICS Ph.D. Thesis
Lawrence Herris Buch 1976 105 p
Avail: Univ. Microfilms Order No. 76-26115

From a fundamental viewpoint, dissipation was derived from the interaction of some small system with a large heat bath. A Lagrangian-Hamiltonian characterization of such a dissipative system is presented in both the classical and quantal regimes, with the Langevin equation as the starting point. In particular, a nonconventional Hamiltonian (i.e., not of the form T + V) which generates the Langevin equation is discussed. The derivation of this Hamiltonian from a fundamental one (which includes the coordinates of the heat bath, and contains the coupling interaction multiplicatively) is investigated. A variational principle for general time-dependent Hamiltonian systems is given, and is used as the basis for an approximation method. Dissert. Abstr.

N77-13739 Pittsburgh Univ., Pa.
ESTIMATION OF LINEAR TIME SERIES MODELS Ph.D. Thesis
Gregory Charles Reinsel 1976 175 p
Avail: Univ. Microfilms Order No. 76-25943

A method is proposed for the estimation of a general class of scalar and vector linear time series models. The models take the form of stochastic difference equations for the dependent variables with exogenous variable inputs, and the disturbances are autocorrelated through an autoregressive moving average process. The method of estimation uses the maximum likelihood approach and is based on Newton-Raphson techniques applied to the likelihood equations. The Newton-Raphson equations are modified by excluding certain asymptotically negligible terms. The resulting two-step estimation procedure involves only generalized least squares estimation in the second step. The method uses calculated residuals as regressors and adjusts the dependent variable in the generalized regression to compensate for the correlation between lagged dependent variable regressors and disturbances. Dissert. Abstr.

N77-13740 Delaware Univ., Newark.
ON IRREGULAR FRACTIONAL FACTORIAL PLANS Ph.D. Thesis
Robert Sterling Northington 1976 193 p
Avail: Univ. Microfilms Order No. 76-24262

An analysis is given of irregular fractional plans which are obtained by either omitting observations from regular fractional plans, or adding observations to regular fractional plans. A procedure for either adding or omitting these observations is described, and the properties of the irregular fractional plans which result are examined. For each plan, it is shown how the effects to be estimated must be arranged in alias sets, if they are to be uniquely estimable. The variance properties of these estimates are discussed. Also included is a listing of some useful irregular fractional factorial plans. Dissert. Abstr.

N77-13741 Stevens Inst. of Tech., Hoboken, N.J.
WEAK INTEGRALS OF VECTOR-VALUED FUNCTIONS WITH RESPECT TO VECTOR-VALUED MEASURES Ph.D. Thesis
John William Burns 1976 142 p
Avail: Univ. Microfilms Order No. 76-25157

Both functions and measures take values in a locally convex topological vector space. This notion of integrability is similar in spirit to other weak integrals, for example the Pettis and Lewis integrals, and in fact in certain situations, e.g., if X is a Banach space or Banach algebra, the H-integral subsumes some well known vector integrals, namely those of Dinculeano and Bartle. Requirements are needed on H for H-integral to possess the classical properties of absolute continuity, countable additivity, and a dominated convergence theorem. It is shown that if H is an integrator set, that is equicontinuous, weakly closed, and weakly sequentially compact, then the H-integral possesses all three of these classical properties. Dissert. Abstr.

N77-13742 Illinois Univ., Urbana.
FINITE-DIFFERENCE SOLUTIONS OF PARABOLIC PARTIAL DIFFERENTIAL EQUATIONS WITH AN OPTIMIZED NON-UNIFORM GRID Ph.D. Thesis
Pedro Lee Kong 1976 81 p
Avail: Univ. Microfilms Order No. 76-24121

Practical techniques of reducing the computational effort required to obtain accurate finite difference solutions of parabolic partial differential equations are given. The computational effort is reduced through the use of an optimized nonuniform grid. The increments vary in geometric progressions and some of the spatial grid points are deleted at certain time or x-locations in a systematic manner. A reduction in the computational effort of several orders of magnitude is possible with the optimized grid over that which is required to obtain the same accuracy with a uniform grid. The magnitude of the roundoff errors has been drastically reduced as a consequence of the large reduction in the required number of grid points. The feasibility of these techniques was established by comparing finite difference solutions of variety of heat conduction and boundary layer problems with known solutions. Dissert. Abstr.

N77-13743 Stanford Univ., Calif.
JOINT DISTRIBUTION OF THE ROOTS OF CERTAIN MATRICES IN MULTIVARIATE ANALYSIS UNDER THE RANK ONE ALTERNATIVE WITH POWER STUDIES OF THE LARGEST ROOT TEST Ph.D. Thesis
Nira Herrmann 1976 147 p
Avail: Univ. Microfilms Order No. 76-26013

The behavior of the roots of certain matrices used in the multivariate analysis of variance is examined. Letting H (p x p)

be the matrix of sums of products for the null hypothesis and E (p x p) be the matrix of sums of products for error, the joint non-null distribution of the roots of the determinantal equation [H-lambda(H+E)] = 0 and the joint non-null distribution of the roots of [H-phE] = 0 under the rank one alternative is found, where E has a central Wishart distribution under both the null hypothesis and the alternative; and H has a central Wishart distribution under the null hypothesis and a non-null (linear) Wishart distribution under the alternative. From these distributions, the distribution of the largest root under the rank one (linear) alternative is obtained for s = min(n sub 1, p) = 2, 3, where p is the number of variates and n sub 1 denotes the degrees of freedom under the hypothesis. Limiting distributions are also obtained by letting the sample size tend to infinity.

Dissert. Abstr.

N77-13744 Princeton Univ., N.J.
THE EFFICIENT OPTIMIZATION OF ARITHMETIC EXPRESSIONS FOR PARALLEL EXECUTION Ph.D. Thesis
Leonard Ira Vanek 1976 132 p
Avail: Univ. Microfilms Order No. 76-23838

Algorithms are presented which compile an arithmetic expression evaluation so that the time required to compute the expression on a computer with many function units (i.e., simple processors) is minimized or made as small as possible with relatively simple heuristics. An optimal algorithm for using associative and commutative transformations to reduce computation time is presented along with a new and simpler proof of its optimality. A second algorithm is given which uses a lattice theoretic analysis to derive the optimal order of application of the transformations. The effectiveness and complexity of both of these algorithms are studied, and the complexities are constrated favorably with those of a pair of competitive algorithms.

Dissert. Abstr.

N77-13745 American Univ., Washington, D.C.
ON NON-NULL DISTRIBUTIONS OF CERTAIN TEST CRITERIA FOR COVARIANCE MATRICES Ph.D. Thesis
Kareem Yakub Nakkash 1976 82 p
Avail: Univ. Microfilms Order No. 76-26214

The hypotheses of homogeneity, sphericity, equality, and independence are discussed. Criterion for statistical variances are derived by various techniques. Applications and special cases are discussed. Dissert. Abstr.

N77-13746*# Carnegie Inst. of Tech., Pittsburgh, Pa. Dept. of Mechanical Engineering.
SINGULARITY COMPUTATIONS
J. L. Swedlow Oct. 1976 37 p refs proposed for presentation at the Intern. Symp. on Innovative Numerical Methods in Applied Engineering Science, Versailles, France, 23-27 May 1977
(Grant NGR-39-087-053)
(NASA-CR-149315; SM-76-6) Avail: NTIS HC A03/MF A01 CSCL 12A

An approach is described for singularity computations based on a numerical method for elastoplastic flow to delineate radial and angular distribution of field quantities and measure the intensity of the singularity. The method is applicable to problems in solid mechanics and lends itself to certain types of heat flow and fluid motion studies. Its use is not limited to linear, elastic, small strain, or two-dimensional situations. Author

N77-13747# Naval Postgraduate School, Monterey, Calif.
A METHOD OF DETERMINING ESTIMABLE FUNCTIONS AND TESTABLE HYPOTHESES IN EXPERIMENTAL DESIGN M.S. Thesis
John Earl Johnson Mar. 1976 40 p refs
(AD-A025413) Avail: NTIS HC A03/MF A01 CSCL 12/1

Applications of the general linear model in experimental design and analysis usually involve design matrices of less than full column rank. This may present a problem in determining what elements and functions of the parameter vector are estimable and what hypotheses are testable. This thesis discusses two methods of answering questions about estimability and testability, where the form of the design matrix determines the method to be used. The two methods, both of which can use computer routines, are: (1) direct mathematical computational approach, and (2) a modification of an analysis of variance routine, with a special case of this method using a modified ANOVA routine and solutions to systems of linear equations. Confounding of effects is developed mathematically in connection with determining estimable functions. Methods discussed in this thesis can be applied to the area of Army Test and Evaluation. Author (GRA)

N77-13748# Naval Postgraduate School, Monterey, Calif.
KOLMOGOROV-SMIRNOV TEST FOR DISCRETE DISTRIBUTIONS Masters Thesis
Mark Edward Allen Mar. 1976 43 p refs
(AD-A024845) Avail: NTIS HC A03/MF A01 CSCL 12/1

The Kolmogorov-Smirnov goodness-of-fit test is exact only when the hypothesized distribution is continuous, but recently Conover has extended the Kolmogorov-Smirnov test to obtain a test that is exact in the case of discrete distributions. Reasons for using this procedure instead of the regular Kolmogorov-Smirnov test when the hypothesized distribution is discrete are given. A computer subroutine is developed to allow easy use of the procedure. The subroutine is then used to demonstrate the conservatism of the regular Kolmogorov-Smirnov test in this case and to investigate some properties of the asymptotic distributions of the test statistics. Author (GRA)

N77-13749# Naval Postgraduate School, Monterey, Calif.
STRUCTURES, ANALYSIS AND DESIGN OF N-DIMENSIONAL RECURSIVE DIGITAL FILTERS Ph.D. Thesis
Lennart Souchon Dec. 1975 335 p refs
(AD-A024830) Avail: NTIS HC A15/MF A01 CSCL 09/5

Formulas for the general term of the Taylor series expansion (impulse response) of a multidimensional recursive digital filter are developed. Of particular interest is a non-recursive combinatorial formulation involving the filter coefficients. These results are applied to develop several new specific stability criteria for low order two-dimensional filters, as well as for the development of some general filter design procedures to achieve a desired impulse response. Also included are some new filter structures and stability conditions for N-dimensional filters. Author (GRA)

N77-13750# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF THE PROPERTIES OF THE EXPONENTIAL MOVING AVERAGE POINT PROCESS M.S. Thesis
Tzy-dah Jathro Lo Mar. 1976 58 p refs
(AD-A024829) Avail: NTIS HC A04/MF A01 CSCL 12/1

Properties of a stationary sequence of random variables chi(i) which have exponential marginal distributions and random linear combinations of order one of an i.i.d. exponential sequence epsilon(i) were discussed by Lawrence and Lewis (1976); they called this model the EMA1 (exponential moving average of order one) point process. This paper will investigate the estimators of the parameter beta of the EMA1 process, and some basic properties of the EMA2 process, and then extend these results to the EMAK process. Author (GRA)

N77-13751# Michigan Univ., Ann Arbor. Electronics Lab.
SOME ASPECTS OF THE WEINER NOISE MODEL
K. Metzger Jul. 1976 33 p refs
(Contract N00014-75-C-0175)
(AD-A027452; UMICH-CEL-TM-111; UMICH-013376-3-M)
Avail: NTIS HC A03/MF A01 CSCL 12/1

The output of a filter whose input is white Gaussian noise is often a good model of random processes which are encountered in the physical world. This memo provides a tutorial discussion of the relationships between the filter transfer functions, the autocorrelation function of the output noise process and the bilateral Laplace transform of this autocorrelation function. Also considered is the use of a truncated Maclaurin series as an approximation to the autocorrelation function for small time shifts. Author (GRA)

N77-13752# Naval Research Lab., Washington, D.C.
OPTIMAL SPECTRAL ESTIMATES Interim Report
William B. Gordon 21 Jun. 1976 20 p refs
(RR0140501; RR0210541)
(AD-A026982; NRL-8014) Avail: NTIS HC A02/MF A01 CSCL 09/4

We consider the general problem of estimating the spectrum of a deterministic signal perturbed by noise. The emphasis of

this report is on the reduction of the deterministic part of the error, and we wish to determine when equispaced sampling is optimal, and to what extent aliasing errors can be avoided by the use of nonequispaced sampling. It is shown that equispaced sampling is not always optimal; so the problem reduces to determining whether any practical advantage would be gained by the use of optimal sampling schemes rather than equispaced sampling schemes when the latter are not optimal. The resolution of this question has been further reduced to a calculus problem, the minimization of an explicitly given function of N variables. This result has been achieved through the use of techniques borrowed from the theory of Sobolev spaces, which also have the advantage that they permit one to define the efficiency of a spectral estimator in terms of signal energy and signal bandwidth, whereas in the classical theories of numerical quadrature, quadrature errors are expressed in terms of bounds on the kth order derivatives of a function, parameters which have little significance in filter design. Author (GRA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N77-13753 Lehigh Univ., Bethlehem, Pa.
A COMPARISON OF SEVERAL ANALYSIS OF VARIANCE STATISTICS BY TYPE 1 ERROR RATES Ph.D. Thesis
Janet Marie Winter 1976 89 p
Avail: Univ. Microfilms Order No. 76-21835

There are several statistics that can be used for analysis of variance; the F, W, J, F^*, and transformation approaches, yielding a statistic LF, are several possibilities. In order to compare these statistics, seventy situations involving three groups, heteroscedastic and/or non-normal populations were considered. An estimate of the actual distribution of the statistics for each situation was graphed. W and F^* were superior to or comparable with F in every situation considered, even when there were no violations of the analysis of variance assumptions. All five statistics had comparable results for non-normal populations with equal cell sizes. These statements, which are based on the comparison of the estimates of the actual type I error rates with the nominal values for the seventy situations considered, do not refute the robustness of the F statistic, but support W and F^* as tending to be more robust. Dissert. Abstr.

N77-13754 Stanford Univ., Calif.
MARKOV DECISION PROCESSES WITH POLICY CONSTRAINTS
John Nafeh 1976 167 p
Avail: Univ. Microfilms Order No. 76-26046

Markov decision processes with policy constraints are considered. The selection of an optimum stationary policy for such processes, in the absence of policy constraints, is a problem which has received a great deal of attention, and was satisfactorily solved. Relatively little attention was given to the case when policy constraints are present or to the formulation of such constraints. Optimum policy sensitivity analysis is also a subject in which little was achieved. Policy constraints are formulated and categorized. A computationally efficient iterative algorithm is developed for selecting the optimum policy for completely ergodic, infinite time horizon Markov decision processes with policy constraints for both the risk-indifferent and risk-sensitive cases. The sensitivity of optimum policies to the policy constraints is analyzed by using the algorithm to compute the value of removing a constraint or a group of constraints. Dissert. Abstr.

N77-13755 North Carolina Univ., Chapel Hill.
THE MEAN SQUARE ERROR OF THE ESTIMATE AS A CRITERION FOR THE ASSESSMENT OF ALTERNATIVE APPROACHES TO MATCHING IN A DUAL RECORD SYSTEM Ph.D. Thesis
Yasar Yesilcay 1975 170 p
Avail: Univ. Microfilms Order No. 76-20091

A simulation study was carried out, which indicated that the approximations used in the derivations were satisfactory. Implications of optimum allocations for the matching operations, under different cost considerations were illustrated by two examples, one hypothetical and the other using real data. Dissert. Abstr.

N77-13756 Rochester Univ., N.Y.
SOME CONTRIBUTIONS TO BAYES NONPARAMETRIC DECISION THEORY Ph.D. Thesis
Siddhartha Ramanlal Dalal 1976 102 p
Avail: Univ. Microfilms Order No. 76-23983

Broadness of the class of mixtures of Dirichlet processes is studied. Priors for some nonparametric problems with a more structured class of distributions are also constructed. The underlying distribution may be symmetric or exchangeable. As applications, Bayes estimates for some nonparametric and robustness problems are derived. Dissert. Abstr.

N77-13757 Pennsylvania State Univ., University Park.
APPLICATION OF STOCHASTIC APPROXIMATION TO FREQUENCY DOMAIN ADAPTIVE FILTERS Ph.D. Thesis
Frederick John Everly 1976 186 p
Avail: Univ. Microfilms Order No. 76-24762

The adaptive processor is designed to be a stochastic adaptive filter so that it can handle the inputs to the processor which are random processes in as efficient a manner as possible. The processor is also recursive so as to be easily updated as the environment changes. In the development of the theory of the stochastic adaptive filter, the orthogonal projection lemma is used to minimize the mean square error of a complex error function that arises from analytic representation of bandpass signals. The results of the minimization are used to derive, from stochastic approximation theory, a special recursive algorithm by which the matrix filter coefficients are obtained for the adaptive processor. This special recursive stochastic algorithm is shown to be a frequency domain multi-input, multi-output adaptive realization of the Wiener filter. Dissert. Abstr.

N77-13758 Claremont Graduate School, Calif.
QUASI-RANDOM TECHNIQUES FOR MONTE CARLO METHODS Ph.D. Thesis
Paul Otto Chelson 1976 128 p
Avail: Univ. Microfilms Order No. 76-23924

Monte Carlo simulation has provided a technique for estimating solutions of a great many problems that have resisted solution by analytical means. Traditional Monte Carlo methods are based on the construction of a probabilistic model in such a way that the problem solution can be represented as the (unknown) expected value of a random variable on a specified probability space. The theoretical expectation is then estimated by sample averages taken over sample sizes sufficiently large for reasonable statistical bounds to be established. Since the entire analysis is statistically based, confidence intervals for the expected value depend on the variance of the estimating random variable. Variance reduction techniques of various sorts have been developed and studied using probabilistic underpinnings, and rather sophisticated methods have been applied successfully, for example, to neutron and photon transport problems. Dissert. Abstr.

N77-13759*# Houston Univ., Tex. Dept. of Mathematics.
FEATURE COMBINATIONS AND THE BHATTACHARYYA CRITERION
Henry P. Decell, Jr. and Salma K. Marani Jun. 1976 11 p refs
(Contract NAS9-15000)
(NASA-CR-151130; Rept-55) Avail: NTIS HC A02/MF A01 CSCL 12A

A procedure for calculating a kxn rank k matrix B for data compression using the Bhattacharyya bound on the probability of error and an iterative construction using Householder transformation was developed. Two sets of remotely sensed agricultural data are used to demonstrate the application of the procedure. The results of the applications gave some indication of the extent to which the Bhattacharyya bound on the probability of error is affected by such transformations for multivariate normal populations. Author

N77-13760*# Houston Univ., Tex. Dept. of Mathematics.
PROGRAM DOCUMENTATION: B-AVERAGE BHATTACHARYYA DISTANCE

Salma K. Marani Aug. 1976 11 p refs
(Contract NAS9-15000)
(NASA-CR-151132; Rept-57) Avail: NTIS MF A01/HC A02 CSCL 12A

The total Bhattacharyya distance is calculated using all N channels. The output of this subroutine is used to construct the B matrix using one or two Householder transformations. FORTRAN calling sequences are given. Author

N77-13761*# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
PERFORMANCE AND SENSITIVITY ANALYSIS OF THE GENERALIZED LIKELIHOOD RATIO METHOD FOR FAILURE DETECTION M.S. Thesis
Ramon A. Bueno Feb. 1977 216 p refs
(Grant NsG-1112)
(NASA-CR-149272; ESL-R-706) Avail: NTIS HC A10/MF A01 CSCL 12A

Results of the generalized likelihood ratio (GLR) technique for the detection of failures in aircraft application are presented, and its relationship to the properties of the Kalman-Bucy filter is examined. Under the assumption that the system is perfectly modeled, the detectability and distinguishability of four failure types are investigated by means of analysis and simulations. Detection of failures is found satisfactory, but problems in identifying correctly the mode of a failure may arise. These issues are closely examined as well as the sensitivity of GLR to modeling errors. The advantages and disadvantages of this technique are discussed, and various modifications are suggested to reduce its limitations in performance and computational complexity. Author

N77-13762# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE CROSS-COVARIANCE OF GUST VELOCITIES AND THEIR TIME-DERIVATIVES
J. C. VanderVaart Dec. 1975 27 p refs
(VTH-207) Avail: NTIS HC A03/MF A01

The relevant basic concepts of stochastic processes and the linear system theory, are summarized and it is shown that although a gust velocity and its time derivative are not correlated at the same instant, the non-zero correlation for different instants in time yields a contribution to the power spectrum and, consequently, to the variance of aircraft output signals. It is also shown that the variance of the time-derivatives of the gust velocities are infinite when using the Dryden or von Karman atmospheric turbulence spectra. Some possible difficulties arising from this fact in the calculation of variances of certain aircraft variables are briefly dealt with. Author (ESA)

N77-13763# Indiana Univ., Bloomington. Dept. of Mathematics.
NONPARAMETRIC STATISTICS USED IN COMMUNICATION, METEOROLOGY, AND RELIABILITY Final Scientific Report, 1 Mar. 1971 - 29 Feb. 1976
Madan L. Puri 29 Feb. 1976 21 p
(Grant AF-AFOSR-2009-71; AF Proj. 9769)
(AD-A025195; AFOSR-76-0542TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report deals with research accomplished in the following areas: selection procedures, asymptotic theory of rank order statistics, the paired comparisons and related more general models, order statistics, statistics of directional data, weak convergence of empirical processes, stochastic processes, characterization of probability distributions, Gauss-Markov theory, tests of normality, storage models, multiple decision problems, and the problems of speed of convergence. GRA

N77-13764# Air Force Human Resources Lab., Brooks AFB, Tex.
DEVELOPMENT OF STATISTICALLY PARALLEL TESTS BY ANALYSIS OF UNIQUE ITEM VARIANCE
Malcolm James Ree May 1976 11 p refs
(AF Proj. 7719)
(AD-A025848; AFHRL-TR-76-41) Avail: NTIS HC A02/MF A01 CSCL 12/1

A method for developing statistically parallel tests based on the analysis of unique item variance was developed. Unique item variance is determined by the multiple correlation of any item with a set of items in an iterative approach. The approach was successfully implemented on a perceptual ability test and replicated on an attitude scale. Author (GRA)

N77-13765# Wisconsin Univ., Madison. Dept. of Statistics.
EXTENDED HAZARD RATE FUNCTIONS: PROPERTIES AND APPLICATIONS
K. G. Mehrotra, R. A. Johnson, and G. K. Bhattacharyya Jul. 1975 30 p refs
(Grant AF-AFOSR-2363-72; AF Proj. 9769)
(AD-A027724; UWIS-DS-75-418; AFOSR-76-0732TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The concept of hazard rate function is extended to include multiple censoring and the vector parameter situation. Some fundamental moment relations are established between these extended hazard rate functions and the score functions. These moment relations are then applied to obtain the exact Fisher information and the locally most powerful rank test for multiple censored samples. Author (GRA)

N77-13766# Wisconsin Univ., Madison. Dept. of Statistics.
SEQUENTIAL PROCEDURES FOR DETECTING PARAMETER CHANGES IN A TIME SERIES MODEL
Michael Bagshaw and Richard A. Johnson Sep. 1975 32 p refs
(Grant AF-AFOSR-2363-72; AF Proj. 9769)
(AD-A027723; UWIS-DS-75-422; AFOSR-76-0735TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Procedures are proposed for monitoring forecast errors in order to detect changes in a time series model. These procedures are based on likelihood ratio statistics which consist of cumulative sums. Both a Wald type sequential scheme and an extension of Page's method are considered. The distributional properties of the statistics are approximated under the assumption that the series follows an integrated autoregressive moving average model. The approximation is based on the limiting Wiener process. An example is also given. Author (GRA)

N77-13767# Wisconsin Univ., Madison. Dept. of Statistics.
LINEAR MODELS, TIME SERIES AND OUTLIERS. 5: OUTLIERS IN TIME SERIES
Bovas Abraham and G. E. P. Box Sep. 1975 34 p
(Grant AF-AFOSR-2363-72; AF Proj. 9769)
(AD-A027695; UWIS-DS-75-400; AFOSR-76-0734TR) Avail: NTIS HC A03/M A01 CSCL 12/1

Assuming a linear time series model a Bayesian approach to the outlier problem is used in which with probability 1 alpha a probability is generated by a standard distribution and with probability alpha is generated by an alternative distribution with the same variance but with the mean displaced. The effect of estimation of parameters is studied and consideration is given to the selection of bad values. GRA

N77-13768# Wisconsin Univ., Madison. Dept. of Statistics.
ON THE COMPLETENESS OF MINIMAL SUFFICIENT STATISTICS WITH CENSORED OBSERVATIONS
G. K. Bhattacharyya, Richard A. Johnson, and K. G. Mehrotra 1976 13 p refs
(Grant AF-AFOSR-2363-72; AF Proj. 9769)
(AD-A027693; AFOSR-76-0733TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The property of completeness, for the minimal sufficient statistics, is investigated in the context of life testing when the set of observations is censored at a fixed time or at a fixed order statistic. Nonparametric families are shown to retain completeness for the observed order statistics and some implications regarding unbiased estimator and similar tests are presented. Most of the common parametric models fail to possess completeness of minimal sufficient statistics under censored sampling in the one-sample, two-sample and regression situations. Author (GRA)

N77-13769# Research Triangle Inst., Research Triangle Park, N.C.
SYSTEMATIC SAMPLING OF TWO-DIMENSIONAL SURFACES AND RELATED PROBLEMS Final Report
John C. Koop May 1976 65 p refs
(Contract F44620-75-C-0015; RTI Proj. 25OU-1123;

AF Proj. 9769)
(AD-A027714; AFOSR-76-0834TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The sampling theory for twenty-one methods of sampling points on a two-dimensional surface, for the purpose of estimating an area of interest, is given in this report. Eleven of those methods involve systematic sampling. Firm results on relative efficiency are available for eight out of the eleven methods of non-systematic sampling. The basic assumption in the sampling theory is that the area of interest is fixed; the basic stochastic element is the sample of points realized through the randomization procedure specific to each method of sampling. The theory is extended to two-stage sampling through an example for aligned systematic sampling. A result on sampling 'lines' with probability proportional to size is given; this relates to the magnitude of the relative variance. GRA

N77-13770# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
THE USE OF HARMONIC ANALYSIS IN SUBOPTIMAL ESTIMATOR DESIGN Interim Report
Steven I. Marcus (Texas Univ., Austin) and Alan S. Willsky 1976 41 p refs
(Grants AF-AFOSR-2273-72; NSF GK-42090; AF Proj. 9769)
(AD-A027707; AFOSR-76-0852TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The state extimation problem for bilinear stochastic systems evolving on compact Lie groups and homogeneous spaces is considered. The problem is motivated by some applications involving rotational processes in three dimensions. Then the theory of harmonic analysis on compact Lie groups is used to define assumed density approximations which result in implementable suboptimal estimators for the state of the bilinear system. GRA

N77-13771# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.
A STOCHASTIC NEWTON-RAPHSON METHOD
Dan Anbar 1 Jul. 1976 18 p refs
(Contract N00014-75-C-0529; NR Proj. 042-276)
(AD-A027395; TR-24) Avail: NTIS HC A02/MF A01 CSCL 12/1

A stochastic approximation procedure of the Robbins-Monro type is considered. The original idea behind the Newton-Raphson method is used as follows. Given n approximations X(1),...,X(n) with observation Y(1),...,Y(n), a least squares line is fitted to the points (X(m),Y(m)),...,(X(n),Y(n)) where m - n may depend on n. The (n-1)st approximation is taken to be the intersection of the least squares line with y = 0. A variation of the resulting process is studied. It is shown that this process yields a strongly consistent sequence of estimates which is asymptotically normal with minimal asymptotic variance. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N77-13772+ Wetenschappelijk en Technisch Documentatie- en Informatiecentrum voor de Krijgsmacht, The Hague (Netherlands).
OPERATIONS RESEARCH 16, O.R. 186 UP TO AND INCLUDING O.R. 197. A BIBLIOGRAPHY
1975 73 p refs Partly in ENGLISH, GERMAN, FRENCH, and DUTCH
(TDCK-67083) Avail: NTIS HC A04

The index contains titles of publications of the Survey Operations Research published in 1975. The titles of reports are designated by their TDCK number, the articles are numbered XOR. Theoretical studies include queuing problems, programming, games, optimum distribution of effort, and stock management. Management applications such as routing, maintenance, and systems analysis are dealt with, whereas military applications involve fighting, probability of hitting, weapon systems, logistics, aeronautics, and education. ESA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N77-13773 Princeton Univ., N.J.
ASPECTS OF GROUP THEORY IN THE STATISTICAL MECHANICS OF HOMOGENEOUS LATTICES Ph.D. Thesis
Fernando Lund 1975 137 p
Avail: Univ. Microfilms Order No. 76-25094

A lattice is built which is homogeneous under the modular group of fractional linear transformations. Its generating function for close packed dimer configurations is found by the Pfaffian method. This requires orienting the lattice. The group SL(2,Z) is employed to this end. Computation of the generating function is then reduced to a particular case of the problem of finding the number of words reducible to the identity for a group which is the free product of two cyclic groups. Solution of this problem gives the dimer generating function as the solution of an algebraic equation. Considered as a function of the bond activities, this function has a polar singularity. An Ising model is built on the same lattice and the free energy per spin is evaluated by solving a dimer problem on an associated lattice following the general prescription of Fisher. It is a rational function of the solution of a system of two algebraic equations. Dissert. Abstr.

N77-13774 Stevens Inst. of Tech., Hoboken, N.J.
THE THEORY OF DISTRIBUTIONS ON FINITE DIMENSIONAL VECTOR SPACES Ph.D. Thesis
Andrew Demetropoulos 1976 216 p
Avail: Univ. Microfilms Order No. 76-25162

Work done by L. Nachbin (1964) was carried out up to the beginnings of advanced distribution theory; specifically he established the Paley-Wiener-Schwartz Theorems for infinitely differentiable functions with compact support and for distributions with compact support. Nachbin's program is extended to include results such as a generalization of the classical Plancherel-Polya Theorem to distributions of compact support and also results dealing with a Fourier characterization of the support function of the convex hull of the singular support of a distribution with compact support. To this end it was necessary to establish in Nachbin's framework the Titchmarsh-Lions Theorem on Supports and the classical Plancherel-Polya Theorem for L squared functions. Furthermore, the Paley-Wiener-Schwartz Theorems are sharpened. Dissert. Abstr.

N77-13775 Missouri Univ., Kansas City.
RINGS IN WHICH EVERY ELEMENT COMMUTES WITH ITS ENDOMORPHIC IMAGES Ph.D. Thesis
Barbara Ann Shappard Currier 1976 50 p
Avail: Univ. Microfilms Order No. 76-25143

In considering quasiregular elements in rings with the endomorphism property it is shown that the commutator ideal of the Jacobson radical is nil and that prime rings are semisimple. Somewhat more satisfying results are obtained when considering idempotent elements in rings with the endomorphism property, for it is shown that idempotent elements are central. As a result is is seen that Artinian rings with the endomorphism property have nilpotent commutator ideal and that regular rings with the endomorphism property are commutative. For rings with the endomorphism property which are generated by their units the commutator ideal is nil. Two examples are given of noncommutative rings with the endomorphism property which are generated by their units. The second of these examples is also a local ring. Finally it is shown that group rings with the endomorphism property must be commutative. Dissert. Abstr.

N77-13776 Arkansas Univ., Fayetteville.
LEFT INVERTIBLE SPACES Ph.D. Thesis
William D. Hammers 1976 87 p
Avail: Univ. Microfilms Order No. 76-26379

The characterization of the n-sphere in terms of inversion by Doyle and Hocking led them to define and study the concept of topological invertibility. A topological space X is invertible if for each nonempty open subset U of X there is a homeomorphism h of X onto itself such that h(X-U) lies in U. Now consider arbitrary topological spaces X and Y. The author defines X to

be left invertible with respect to the space Y, denoted X L Y, if for each proper closed subset C of X and nonempty open subset V of Y there exists a homeomorphism f of C onto f(C), f(C) is contained in V and f(C) is closed in Y. An invertible space X is left invertible with respect to itself, and several other examples of left invertible spaces are presented. Properties of subspaces of left invertible spaces which are transferred to the domain space are investigated. Dissert. Abstr.

N77-13777 California Univ., Los Angeles.
COMPLEX VARIABLE THEORY GENERALIZED TO ELECTROMAGNETICS: THE THEORY OF FUNCTIONS OF A QUATERNION VARIABLE Ph.D. Thesis
Daniel Dale Evans 1976 182 p
Avail: Univ. Microfilms Order No. 76-25191

All of the relevant parts of Fueter's theory were taken from the foreign literature and made more complete. Beyond this, the concept of regular variables was greatly generalized and a more general theory derived. In particular, with the help of these more general variables, a three dimensional theory was derived which is quite distinct from Fueter's theory, which is four dimensional. Typaldos' transformation is generalized and put on a firm foundation on the basis of analytic continuation. The entire formalism is pushed to its intrinsic limits of generality. The results are obtained by first assuming the regularity conditions, which can be analytically continued into Maxwell's equations in two distinct ways. The basic analytic tools used include quaternions, their algebra, Euler's theorem on homogeneous functions, the generalized Stokes theorem, and analytic continuation. The basic quantities the theory is concerned with are homogeneous regular, right regular, and left regular quaternion and biquaternion valued polynomials. Dissert. Abstr.

N77-13778 Southwestern Louisiana Univ., Lafayette.
NEAR INTEGRAL DOMAINS AND H-MONOGENIC NEAR RINGS Ph.D. Thesis
Horace Ray Olivier 1976 45 p
Avail: Univ. Microfilms Order No. 76-23971

A partial survey of the results on near integral domains, and an introduction of an extension of near integral domains, H-monogenic near rings are considered. The fixed-point-free automorphisms on the additive group of the near ring or on a subgroup of the additive group of the near ring play a key part in the investigation. Ferrero has investigated the construction of finite strongly monogenic near rings which gives a construction of a class of near integral domains. An example of an infinite near integral domain with an additive group which is not nilpotent is given. A direct product decomposition for the multiplicative semigroup of a finite near integral domain (a right group) is discussed. The study of H-monogenic near rings is initiated. The additive group of a finite H-monogenic near ring is a semidirect sum. Dissert. Abstr.

N77-13779 Stanford Univ., Calif.
APPROXIMATION OF GEODESICS ON RIEMANNIAN MANIFOLDS Ph.D. Thesis
Stewart Alan Smith 1976 196 p
Avail: Univ. Microfilms Order No. 76-26079

The global properties of geodesics and of the exponential map for some Hilbert manifolds are explored. The method involves a progression from two dimensional results to finite dimensional results and then to the infinite dimensional case. Finite-dimensional Riemannian manifolds each having an upper bound K for all sectional curvatures in some 'large' ball about a point are considered. On these surfaces a lower bound is found for the lengths of curves depending only on their end points. Using these results, a geodesic from p in U is compared to a neighboring curve which is in the same 'homotopy class' and shows that a bound exists for the distance between the curves. In the finite dimensional case, separable Hilbert space with a Riemannian metric uniformly equivalent to the Euclidean metric on a ball B is considered. Dissert. Abstr.

N77-13780 State Univ. of New York, Buffalo.
ON ALGEBRAIC EXTENSIONS OF SUBRINGS IN AN ORDERED RING Ph.D. Thesis
Madhav Vishwanath Tamhankar 1976 26 p
Avail: Univ. Microfilms Order No. 76-26567

The first complete proof of the Albert-Neumann theorem is: an element algebraic over a central subfield in an ordered ring is central. The present proof is based on a system of a great many relations involving derivatives, particularly f prime (a), and the commutators of the polynomial f(a) in any ring and the principle that, whatever the signs of x and y, the signs of xy and yx (if not zero) are the same. The main theorem is: an element a algebraic over a central subring of an ordered ring is central if f prime (a) is not a divisor of zero, where f prime is the derivative of the polynomial f satisfied by a. The Albert-Neumann Theorem is a consequence of this theorem. Another consequence is that in ordered rings without divisors of zero algebraic extensions of central subrings are central.
Dissert. Abstr.

N77-13781 Rochester Univ., N.Y.
ON FREE ABELIAN GROUPS IN TOPOSES Ph.D. Thesis
John Paul Walker 1976 63 p
Avail: Univ. Microfilms Order No. 76-24029

A (Lawvere-Tierney) topos is a Cartesian closed category which has a truth value object, omega, which serves to classify subobjects in the sense that for each object, X, there is a natural bijective correspondence between subobjects of X and characteristic functions from X to omega. Currently, toposes are a prominent topic of investigation by category theorists interested in logic and in algebraic geometry. The first example of topos is the category of abstracts sets and mappings, in which omega is the number 2. Freyd suggests that in fact toposes generalize the category of sets. Basic definitions and useful propositions from the general theory of toposes are examined. The structure of Abelian group in a topos is described. The principal result, is that in a topos, any associative, commutative, cancellable binary operation generates a canonical Abelian group. Dissert. Abstr.

N77-13782 Wisconsin Univ., Madison.
CLASSES OF SPACES DEFINED BY NESTED SEQUENCES OF SETS AND MAPS AMONG SUCH SPACES Ph.D. Thesis
Andrew Joseph Berner 1976 72 p
Avail: Univ. Microfilms Order No. 76-18869

The images of seven classes of spaces under biquotient, countably biquotient, hereditarily quotient, and quotient maps are discussed. These seven classes are first countable spaces, locally compact spaces, spaces of pointwise countable type, locally countably compact spaces, strict q spaces, locally conditionally compact spaces, and q spaces. All the classes of spaces are defined in terms of the concept of S-sequences. Examples are given of a completely regular space which is relatively bi-quasi-k, but not relatively quasi-k, and a completely regular relatively quasi-k space which is not quasi-k. The latter construction uses the continuum hypothesis. Theorems about products of maps are used to prove theorems about products of spaces. The class of bi-k spaces is proved to be precisely the class of spaces whose product with every compact space is sequentially q.
Dissert. Abstr.

N77-13783 Stanford Univ., Calif.
PERTURBATIONS AND SUBSEQUENCES OF SCHAUDER BASES IN CLASSICAL BANACH SPACES Ph.D. Thesis
Alfred David Andrew 1976 58 p
Avail: Univ. Microfilms Order No. 76-25967

It is shown that the Haar System in L(p), $p > 1$, may be 1-perturbed. A weak condition is given, ensuring the perturbability of bases in C(K) spaces, K compact, metric, and uncountable; and it is shown that the Schauder System for C[0,1) and the Haar System for C(D), D denoting the Cantor Set, may be 1-perturbed. An example of a basis is constructed for C(0,1) which may not be B-perturbed for any positive B. The behavior of subsequences of the Haar System in C(D) is studied, and it is shown that in contrast to the L(p), $p > 1$, case, there are uncountably many nonisomorphic spaces which arise as the spans of subsequences. In particular, for any compact metric space H, there exists a subsequence whose span is isomorphic to C(H). It is shown that no subsequence of the Haar System spans a reflexive space, and a sufficient condition is given for the span to contain an isomorph of C(D). Dissert. Abstr.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N77-13784 Princeton Univ., N.J.
ELECTROMAGNETIC AND GRAVITATIONAL INTERACTION OF A RELATIVISTIC SPHERICAL TOP Ph.D. Thesis
Sergio Andres Hojman 1975 103 p
Avail: Univ. Microfilms Order No. 76-23805

The electromagnetic and gravitational interactions of a relativistic spinning particle using a Lagrangian approach were studied. Problems of the old theories are reviewed and discussed. Equations of motion of a top moving in simple electromagnetic fields are solved, and it is shown that classical trajectories do not bend backwards in time ruling out the possibility of classical pair creation (annihilation). Equations of motion of a top in a gravitational field are also derived according to general relativity and a comparison is made. Dissert. Abstr.

N77-13785# Institut Franco-Allemand de Recherches, St. Louis (France).
COMPUTATION OF BALLISTIC TRAJECTORIES: ARC CALCULATION AND INTERPOLATION METHODS [CALCUL DE TRAJECTOIRES BALISTIQUES: CALCUL PAR ARCS ET METHODES D'INTERPOLATION]
A. Carriere 22 Jul. 1975 24 p In FRENCH
(ISL-R-122/75) Avail: NTIS HC A02/MF A01

Two methods for computing ballistic trajectories are described and the performance of these methods compared. They include the arc trajectory calculation using the Runge-Kutta technique and the interpolation methods based on the Sugot fictitious velocity method. It is shown that the arc computation method is suitable for high accuracy trajectory analysis; the fictitious velocity method is less precise but 50 times more rapid. ESA

N77-13786# Picatinny Arsenal, Dover, N.J.
MOMENTS-2: A COMPUTER PROGRAM TO CALCULATE MOMENTS AND PRODUCTS OF INERTIA OF ASYMMETRIC OBJECTS
Edward B. Lacher Mar. 1976 173 p refs
(AD-A025409; PA-TR-4945) Avail: NTIS HC A08/MF A01 CSCL 20/11

This report describes the computer program MOMENTS-II, which is a greatly modified and extended version of the computer program MOMENTS, described in Picatinny Arsenal Technical Report 4143, July 1971. The present report supersedes the previous publication. MOMENTS-II is capable of calculating the components of the inertia tensor (moments and products of inertia) of combinations of arbitrarily located and oriented asymmetric objects with respect to arbitrary rectangular systems; as well as of calculating other physical properties such as mass, center of gravity and principal axes of these objects. The report also describes the model employed and the analysis leading to the derivations of the formulae used by MOMENTS-II, and for convenience is divided into three chapters containing information specifically directed towards the program user, programmer, and analyst respectively. Author (GRA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N77-13787 British Library Lending Div., Boston Spa (England).
TO DETERMINE THE SOUND POWER OUTPUT OF FANS
K. Biehn and P. Koeltzsch 26 May 1976 16 p refs Transl. into ENGLISH of Maschinenbautechnik (West Ger.), v. 25, no. 1, 1976 p 15-18
(BLL-NEL-TT-2674-(6075.461)) Avail: British Lending Library Div., Boston Spa, Engl.

A guide to determining the sound power of fans is presented. Users are introduced to the problems of determining the sound power of fans. Topics discussed include noise parameters to be determined for fans, the suitable methods for doing so (free-field, acoustic chamber and in-duct methods), and the associated measuring devices such as measuring ducts, duct closures and microphone extensions. An indication is provided of some outstanding problems. Author

N77-13788 Rhode Island Univ., Kingston.
INVESTIGATION OF THE REDUCTION OF THE TARGET STRENGTH OF A FLAT STEEL TEST PLATE Ph.D. Thesis
Jan Phillip Holland 1976 118 p
Avail: Univ. Microfilms Order No. 76-25522

An Acoustic Pressure Reduction System (APRS) was developed that can reduce the target strength of a flat steel test plate. The APRS utilizes transducers mounted on the plate to sense the acoustic pressure wave impinging on that plate. A signal that is out of phase with the impinging wave is transmitted by the transducers to cancel or decrease the acoustic pressure wave at the aspect angle of the impinging wave, i.e., the monostatic target strength. The APRS was operated and measured experimentally to demonstrate the acoustic pressure reduction that could be achieved at different aspect angles and when using different numbers of transducers. An Acoustic Pressure Reduction Technique (APRT) computer program was generated to provide theoretical results for comparison with the results that were obtained with the APRS. The agreement between the APRT theoretical results and the APRS experimental results was very good for the test cases examined. Dissert. Abstr.

N77-13789 Catholic Univ. of America, Washington, D.C.
GENERATION OF IMAGES BY MEANS OF SOUND WAVES USING A TWO-DIMENSIONAL HYDROPHONE ARRAY AND A SAMPLING FILTER PROCESSOR Ph.D. Thesis
Nasser Jawher Mohamed 1976 143 p
Avail: Univ. Microfilms Order No. 76-24291

A new imaging technique that uses spatial electric filters was developed. The technique was based on the spatial time sampling principle. The filter was a time variable device and it was not restricted to a specific time variation. However, monochromatic sinusoidal time variations were considered only. Two-dimensional inverse transformations were carried out on two stages. The first stage was called the two-dimensional sampling filter, and the second was called the storage and distribution circuit. Two-dimensional images were formed by generating one line image at a time. Two-dimensional focusing was analyzed by expanding the incident spherical wavefronts in a power series and retaining the first two terms only. The depth of field for acoustic images was defined and evaluated numerically. Effect of errors in the sampling times, finite duration of the sampling pulses, and finite circuit components were determined. Dissert. Abstr.

N77-13790 Pennsylvania State Univ., University Park.
A THEORETICAL AND EXPERIMENTAL STUDY OF ACOUSTIC PROPAGATION IN MULTISECTIONED CIRCULAR DUCTS Ph.D. Thesis
Barry R. Wyerman 1976 181 p
Avail: Univ. Microfilms Order No. 76-24812

The propagation of plane waves and higher order acoustic modes in a circular multisectioned duct was studied. A unique source array consisting of two concentric rings of sources, providing phase and amplitude control in the radial, as well as circumferential direction, was developed to generate plane waves and both spinning and non-spinning higher order modes. Measurements of attenuation and radial mode shapes were taken with finite length liners inserted between the hard wall sections of an anechoically terminated duct. The experimental results were compared with a mathematical model for the multisectioned duct which includes the modal transmission duct and reflection effects at the interface between sections with different linear admittance. Good agreement was found between measurements and theory. Dissert. Abstr.

N77-13791*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SEMIEMPIRICAL AIRFRAME NOISE PREDICTION MODEL AND EVALUATION WITH FLIGHT DATA
Alan S. Hersh (Hersh Acoustical Engineering), Frank W. Burcham, Jr., Terrill W. Putnam, and Paul L. Lasagna Dec. 1976 36 p

refs
(Contract NAS4-2250)
(NASA-TM-X-56041; H-951) Avail: NTIS HC A03/MF A01 CSCL 20A

A semiempirical maximum overall sound pressure level (OASPL) airframe noise model was derived. Noise radiated from aircraft wings was modeled on the trailing edge diffractes quadrupole sound theory. The acoustic dipole sound theory was used to model noise from the landing gear. The model was correlated with maximum OASPL flyover noise measurements obtained for three jet aircraft. One third octave band sound pressure level flyover data was correlated and interpreted.
Author

N77-13792*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACOUSTIC SIGNATURES OF A MODEL FAN IN THE NASA-LEWIS ANECHOIC WIND TUNNEL
Donald A. Dietrich, Marcus F. Heidmann, and John M. Abbott 26 Jan. 1977 17 p refs Presented at the 15th Aerospace Scis. Meeting, Los Angeles, 24-26 Jan. 1977; Sponsored by AIAA
(NASA-TM-X-73560; E-9002) Avail: NTIS HC A02/MF A01 CSCL 20A

One-third octave band and narrowband spectra and continuous directivity patterns radiated from an inlet are presented over ranges of fan operating conditions, tunnel velocity, and angle of attack. Tunnel flow markedly reduced the unsteadiness and level of the blade passage tone, revealed the cutoff design feature of the blade passage tone, and exposed a lobular directivity pattern for the second harmonic tone. The full effects of tunnel flow are shown to be complete above a tunnel velocity of 20 meters/second. The acoustic signatures are also shown to be strongly affected by fan rotational speed, fan blade loading, and inlet angle of attack. Author

N77-13793# Institut Franco-Allemand de Recherches, St. Louis (France).
PRODUCTION AND RECORDING OF SPARK AND DETONATION BANGS FOR INVESTIGATION OF THEIR EFFECT ON THE HEARING OF GUINEA PIGS [ERZEUGUNG UND REGISTRIERUNG VON FUNKEN- UND DETONATIONSKNALLEN ZUR UNTERSUCHUNG IHRER WIRKUNG AUF DAS HOERVERMOEGEN VON MEERSCHWEINCHEN]
M. Froboese, P. Drews, G. Parmentier, and H. W. Koch 11 Jul. 1975 52 p refs In GERMAN
(Contract DRME-74/024)
(ISL-R-121/75) Avail: NTIS HC A04/MF A01

A method for generating shock waves of a certain peak pressure and overpressure duration was developed to investigate variations in the hearing of guinea pigs subjected to impulsive noise. Peak pressure range was specified to be between 15 and 120 mbar and overpressure duration between 50 and 1000 microsec. The maximum sound pressure in the wave front was to decay exponentially, a condition satisfied by spark and detonation bangs. Appropriate noise generators were tested, and the distance between source and ear, satisfying the peak pressure and pressure duration condition, was determined. ESA

N77-13794# European Space Agency, Paris (France).
CONVECTION AND REFRACTION EFFECTS OF AN ACOUSTIC WAVE IN A FLOW
Jacques Randon Oct. 1976 72 p refs Transl. into ENGLISH of 'Effets de Convection et de Refraction d'une Onde Acoustique dans un Ecoulement', ONERA, Paris Report ONERA-NT-1975-2, 1975
(ESA-TT-320; ONERA-NT-1975-2) Avail: NTIS HC A04/MF A01

Refraction effects due to flow velocity and temperature were surveyed and applied to the atmospheric propagation of acoustic waves and to the propagation of acoustic waves in a hot jet of finite radial dimension. This work is used, in two-dimensional space, for the calculation involved in predicting the acoustic radiation of a hot jet. Author (ESA)

N77-13795# European Space Agency, Paris (France).
ACOUSTIC FLUCTUATIONS GENERATED BY THE VENTILATED WALLS OF A TRANSONIC WIND TUNNEL
Xavier Vaucheret Oct. 1976 22 p refs Transl. into ENGLISH of 'Fluctuations Acoustiques Engendrees par les Parois Permeables d'une Soufflerie Transsonique', ONERA, Paris Report ONERA-TP-1975-106, 1975 Presented at the AGARD Conf. on Wind Tunnel Design and Testing Tech., London, 6-8 Oct. 1975 Original report in FRENCH previously announced as N76-25237
(ESA-TT-324; ONERA-TP-1975-106) Avail: NTIS HC A02/MF A01

In order to reduce the noise level due to the acoustic perturbations generated by the wall perforations in the transonic test section, a classification of the noises emitted by several ventilated panels inserted in the test section was established. For this experimentation, the horizontal perforated walls are closed with adhesive tapes covering the holes. A solution consists of gluing, inside the test section, a plastic gauze with small mesh on the original walls. The advantage of this solution is the conservation of the original walls. It allows reducing the noise to a level similar to that measured for solid, i.e., closed, wall.
Author (ESA)

N77-13796# Naval Underwater Systems Center, New London, Conn.
TIME DELAY ESTIMATION
G. Clifford Carter 9 Apr. 1976 247 p refs
(NUSC Proj. A-752-25; ZR00001)
(AD-A025408; NUSC-TR-53) Avail: NTIS HC A11/MF A01 CSCL 17/3

This study investigates methodologies for passive estimation of the bearing to a slowly moving acoustically radiating source. The mathematics for the solution to such a problem is analogous to estimating the time delay (or group delay) between two time series. The estimation of time delay is intimately related to the coherence between two time series. New results on using coherence to provide information about linear and nonlinear systems are presented. The maximum likelihood (ML) estimate of time delay is derived; the explicit dependence of the estimate on coherence is evident in the realization in which the two time series are prefiltered (to accentuate frequency bands of high coherence) and subsequently crosscorrelated. Also included are statistics of the estimates of the magnitude-squared coherence (MSC), including the probability density function, the cumulative distribution function, and the m-th moment of the MSC estimate. A complete discussion of the bias and the variance of the MSC estimates is presented. The receiver operating characteristics of a linearly thresholded coherence estimation detector are also presented. A general FORTRAN 4 computer program using the fast Fourier transform to estimate time delay is given. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N77-13797 Virginia Univ., Charlottesville.
MOLECULAR ORBITAL STUDIES ON UNIMOLECULAR REACTIONS Ph.D. Thesis
John Kirk George 1976 151 p
Avail: Univ. Microfilms Order No. 76-24994

Studies of orbital influence on reaction paths in some unimolecular reactions using well-known approximate methods, and a new method for direct determination of the low energy path for reactions are reported. A general discussion is given of methods used in theoretical studies of chemical reactivity. The seemingly anomalous stereochemical course of the pyrolysis of diazabicycloheptene is explained using correlation diagrams and qualitative MO arguments. The generation of the potential surface for a trithiapropellane and its associated diradical was simplified by intuitive choice of one variable specifying the reaction path; a new mechanism for bond stretch isomerism is discerned.
Dissert. Abstr.

N77-13798 Princeton Univ., N.J.
HYDROGEN ATOMS: RARE EARTH IONS: MAGNETIC RESONANCE STUDIES ON POLYCRYSTALLINE SOLIDS AND SURFACE SYSTEMS RELEVANT TO CATALYSIS AND

OTHER ENERGY-RELATED RESEARCH Ph.D. Thesis
Lennox E. Iton 1976 444 p
Avail: Univ. Microfilms Order No. 76-23831

Electron Spin Resonance was applied to the study of diverse polycrystalline systems of interest in surface studies, catalysis, and energy-related research. Paramagnetic species investigated range from the small H atom, stabilized in solids, to the heavy rare earth ions, present in catalytically important solids; additionally, novel behavior in a cooperatively interacting magnetic system was observed. Dissert. Abstr.

N77-13799 Rochester Univ., N.Y.
A QUANTUM-ELECTRODYNAMICAL STUDY OF SOURCE FIELD DETECTION AND INTERFERENCE EFFECTS IN SPONTANEOUS EMISSION Ph.D. Thesis
Iam Choon Khoo 1976 99 p
Avail: Univ. Microfilms Order No. 76-24009

The quantum electrodynamics of two atoms in free space interacting with one another via the coupling of their dipole moments to the electromagnetic field are studied using the Heisenberg operator approach. The problem is formulated in such a way that one of the atoms, which has two-levels, plays the role of a detector; the other atom, whose levels are arbitrary but do not involve cascade-like transitions, plays the role of the source. Several aspects of the interaction are considered, by first solving for the relevant atomic and field dynamical quantities of interest using a perturbation calculation. The case where both atoms are two-level is first considered in the context of two possible optical detection processes. The source atom is in an arbitrary state of excitation. Dissert. Abstr.

N77-13800 Rochester Univ., N.Y.
TRANSIENT COHERENT OPTICAL EFFECTS IN ATOMS Ph.D. Thesis
Richard Lawrence Kornblith 1976 200 p
Avail: Univ. Microfilms Order No. 76-24032

Transient coherent effects in multilevel atoms are studied theoretically, using both semiclassical and quantum radiation theories. It is found that while the conventional semiclassical theory adequately describes stimulated effects, it does not explain recently observed details in resonance fluorescent emission. By introducing novel techniques, the quantum radiation theory is extended and applied to this problem. The effects observed in resonance fluorescence are explained and several new effects are predicted. Using a general development applicable to both theories, it is shown that the semiclassical and quantum radiation theories differ in the prediction of quantum intensity beats. By deriving a modified Wiener-khintchine theorem for nonstationary processes, the power spectrum of the radiated field is shown to be equivalent to its instantaneous momentum distribution.
Dissert. Abstr.

N77-13801 Wisconsin Univ., Madison.
LIFETIMES AND TRANSITION PROBABILITIES FOR STATES IN THE FIRST EXCITED CONFIGURATION OF ATOMIC IODINE Ph.D. Thesis
Lloyd Gordon Williams 1976 210 p
Avail: Univ. Microfilms Order No. 76-18914

Lifetimes and transition probabilities for states in the 5p46s configuration of iodine have been determined using Hanle-effect measurements, absorption measurements, and intermediate coupling calculations. Atomic iodine for these experiments was produced by thermal dissociation of I2; resonance radiation was used both for the absorption measurements and (unpolarized) for excitation of fluorescence in the Hanle-effect experiments.
Dissert. Abstr.

N77-13802 Illinois Univ., Urbana.
STUDIES IN MOLECULAR DYNAMICS Ph.D. Thesis
Donald William Noid 1976 114 p
Avail: Univ. Microfilms Order No. 76-24151

A practical method, using Poincare surfaces of section, is described for calculating for smooth potentials the set of toplogically independent phase integrals, the number of such integrals equalling the number of coordinates in a nondegenerate system. The method was modified to treat systems which had large energy exchange among the unperturbed modes, by using curvilinear surfaces of section. The dipolar correlation function and the infrared spectrum of a multidimensional model of a hydrogen bonding system were calculated. Dissert. Abstr.

N77-13803 Emory Univ., Atlanta, Ga.
NMR STUDIES OF MOLECULAR STRUCTURE AND CONFORMATION Ph.D. Thesis
Robert Walter Smithwick, III 1976 104 p
Avail: Univ. Microfilms Order No. 76-25084

Through the geometrical dependence of the interactions between pairs of dipoles a molecular structure or conformation giving these measured interactions may, in principle, be calculated. Two significantly different phenomena, which are described by dipole-dipole interactions, arise from interactions either with other nuclei or with the less common paramagnetic species. Examples chosen for this study are drawn from the areas of NMR spectra of molecules in ordered media and in the presence of lanthanide shift reagents. In the case of isotropic fluids dipole-dipole interactions average to zero whereas in solids or in liquid crystalline solvents these interactions persist and must be taken into account in interpreting the NMR spectra. Analyses of solutes in lyotropic liquid crystals are described and, in certain cases, derived inter-proton distance ratios are presented. Finally, a lyotropic liquid crystalline system of utility to NMR studies is presented. This system is characterized by both NMR and optical studies.
Dissert. Abstr.

N77-13804 Delaware Univ., Newark.
THE PROTON AFFINITIES OF GASEOUS MOLECULES Ph.D. Thesis
Danne Elizabeth Smith 1976 162 p
Avail: Univ. Microfilms Order No. 76-24254

In order to study relative basicities without the complication of solvation effects an investigation of proton transfer reactions in the gas phase was undertaken. Relative proton affinities, which are a measure of Bronsted base strength, were determined for several compounds including fluorosulfuric acid, trifluoromethanesulfonic acid, sulfuric acid, and sulfur trioxide. The relative order of basicity in the gas phase was found to parallel closely the relative acidity in solution. Those compounds with proton affinities greater than that of FSO3H are protonated by FSO3H in solution, while those compounds with a proton affinity less than that of FSO3H are not. Dissert. Abstr.

N77-13805 Texas Univ., Austin.
OPTICAL TRANSITION MEASUREMENTS FROM HEAVY-ION-NITROGEN COLLISIONS, 1. FISSION AND INTERNAL CONVERSION STUDIES, 2 Ph.D. Thesis
John Riley White 1976 138 p
Avail: Univ. Microfilms Order No. 76-26726

Molecular nitrogen was bombarded with H+, Ne(+), He(+), N(+), and Ar(+) ions having energies in the keV range. These ionmolecule collisions gave rise to visible wavelength transitions which were measured with an Ebert type monochrometer in both first and second orders. The spectral range considered was governed entirely by the photomultiplier tube response (290-630 nm) and two molecular band systems, called N2 second positive and the N2 + first negative, were seen in this energy region. The intensities of each of these bands were obtained and compared with those of a gas discharge tube. Whereas there was no apparent dissociation of the nitrogen molecule into atomic species in the gas discharge spectrum, there was large scale dissociation in the heavy-ion excitation spectra. Many of the atomic transitions seen there were identified and found to come from either singly or doubly ionized nitrogen atoms.
Dissert. Abstr.

N77-13806 Iowa Univ., Iowa City.
TWO TECHNIQUES FOR STUDYING ATOMIC INTERACTIONS: A HYDROGEN ATOM BEAM SOURCE AND A METHOD OF OBTAINING ACCURATE DISSOCIATION ENERGIES Ph.D. Thesis
Kermit Rainsford Way 1976 87 p
Avail: Univ. Microfilms Order No. 76-26347

A pair of techniques--one experimental and one theoretical--were developed. The first technique was a very intense source of superthermal hydrogen atoms. Using an archeated source head, the method necessary to operate with pure hydrogen gas was found. After obtaining an arc with argon flowing at about

2.5 millimoles/sec, the gas is carefully changed to hydrogen flowing at 0.35 to 0.7 millimoles/sec. The hydrogen atom flux produced by this source was determined to be at least 4 x 10 to the 17th power atoms/srsec; the translational energy of the hydrogen atoms was approximately 5 eV. The second technique was a new method for obtaining dissociation energies from electronic spectroscopic data. In this method, line shapes for transitions to rotationally predissociating levels in which the barrier is at long range are calculated for trial potentials which have the correct long range behavior. By comparing the results of these calculations with observed lines, very tight bounds on the dissociation limit can be achieved. Dissert. Abstr.

N77-13807 Arkansas Univ., Fayetteville.
STRUCTURAL STUDIES OF SOME SELECTED CYCLIC SYSTEMS USING GAS ELECTRON DIFFRACTION Ph.D. Thesis
Massoud Askari 1976 287 p
Avail: Univ. Microfilms Order No. 76-26401

The molecular structures of a series of substituted cyclohexanones are investigated using gas electron diffraction combined with molecular mechanics and vibrational analysis. The series involved 2,2,6-trimethylcyclohexanone, 10-methyltrans-2-decalone, and 1,1,10-trimethyl-trans-2-decalone. The sterical effects of multiple substitution on the cyclohexanone system are discussed. The studies demonstrate that combined electron diffraction, molecular mechanics and vibrational analysis is a powerful and promising tool for the investigation of complex systems. Conclusive results are produced which can not usually be obtained by any other experimental technique. Dissert. Abstr.

N77-13808 Stanford Univ., Calif.
DYNAMIC LIGHT SCATTERING FROM MACROMOLECULES WITH APPLICATIONS TO POLYDISPERSE SYSTEMS, PART 1. FLUORESCENCE CORRELATION SPECTROSCOPY AS A PROBE OF MOLECULAR DYNAMICS, PART 2 Ph.D. Thesis
Sergio Ramiro AragonSanJuan 1976 307 p
Avail: Univ. Microfilms Order No. 76-25968

The autocorrelation function of the scattered electric field was calculated for a variety of systems. A quantum mechanical derivation of the scattering amplitudes, which generalized the well-known Kramers-Heisenberg formula to an assembly of weakly interacting charges, is presented. The assumptions and approximations required to obtain the standard correlation function from this scattering amplitude in terms of molecular polarizabilities are examined in detail. A theory relating rotational Brownian motion to the time autocorrelation function of the intensity of radiation from a fluorescent system composed of spherical rotors is presented. The calculation shows three relaxation times, two associated with the natural decay of the fluorescence. The correlation function contains terms that relax independently of the fluorescence decay time, thus arbitrarily extending the time range over which rotational diffusion can be studied by fluorescence. Dissert. Abstr.

N77-13809 Wisconsin Univ., Madison.
BEAMS OF CHARGED PARTICLES ORIGINATING FROM AQUEOUS SOLUTIONS Ph.D. Thesis
Thomas David Hall 1976 98 p
Avail: Univ. Microfilms Order No. 76-18878

An apparatus to form beams of particles a few tenths of a micron in diameter was designed and constructed. The particle beam is extracted from the core of the jet, ionized by electron impact ionization in a crossed electron beam, and collected in a Faraday cup placed on the beam axis. The charge to kinetic energy ratio of the beam particles is determined by electrostatically deflecting the beam out of the Faraday cup. Beams of polystyrene latex spheres 0.557 and 0.357 microns in diameter were formed. In addition beams of lysozyme have been produced. The charging characteristics of these particles in the electron beam are discussed. Dissert. Abstr.

N77-13810 Stanford Univ., Calif.
PHOTOEMISSION AND THERMAL DESORPTION STUDIES OF THE ADSORPTION OF SIMPLE MOLECULES ON TRANSITION METALS AND ALLOYS Ph.D. Thesis
Kenneth Yum Yu 1976 224 p
Avail: Univ. Microfilms Order No. 76-26097

The sorption (physisorption, chemisorption and incorporation) of simple gas molecules on single crystal molybdenum disulfide, polycrystalline iron, copper and aluminum, is investigated. The electronic structure of the alloy was studied by photoemission. By tuning through a photon energy range from seven to 25 electron volts, the electronic structure of the first few atomic layers of the alloy (i.e., surface electronic structure) or the deeper lying layers (i.e., bulk electronic structure) were studied preferentially. This method utilized the short escape length at high photon energy and the much longer escape length at low photon energy. The surface electronic structure is shown to be localized and is insensitive to surface ordering or local environment. Simple models of density of states are proposed for both the surface and the bulk of the alloy and comparison with existing theories are made. Dissert. Abstr.

N77-13811 Arkansas Univ., Fayetteville.
LOW-ENERGY ELECTRON IMPACT STUDIES OF H2 Ph.D. Thesis
James Watson, Jr. 1976 130 p
Avail: Univ. Microfilms Order No. 76-26421

The excitation of H2 by low energy electron impact is studied by the optical method. A detailed optical analysis is carried out on nine spectral lines corresponding to electronic transitions of the neutral H2 spectrum. Absolute emission cross section measurements are carried out at 200 eV electron energy and 30 mtorr H2 gas pressure and are placed on an absolute scale by comparison with the reported cross section of the lambda = 4686A line of the He2 spectrum. Using the measured absolute emission cross sections and the calculated branching ratios, the apparent cross section for each observed vibrational transition is calculated. In addition absolute intensity measurements of ten electronic transitions of the singlet, triplet and doubly excited H2 spectra are carried out at lambda = 8A spectral resolution and electron energies in the range of 0 to 200 eV. Dissert. Abstr.

N77-13812 Princeton Univ., N.J.
INELASTIC ELECTRON SCATTERING IN LITHIUM FLUORIDE Ph.D. Thesis
John Richard Fields 1976 239 p
Avail: Univ. Microfilms Order No. 76-23829

Inelastic electron scattering spectrometer has been used to study the electronic excitations of a thin single crystal of lithium fluoride. The data has been corrected for double and triple scattering, and the dielectric function has been obtained by the usual Kramers-Kronig analysis. The reflectivity calculated from our data is in reasonable agreement with optical reflectivity experiments in the range 10 to 30 eV. Dissert. Abstr.

N77-13813 Stanford Univ., Calif.
CRITICAL PROPERTIES OF THE TWO-DIMENSIONAL XY MODEL Ph.D. Thesis
Douglas Michael Lublin 1976 67 p
Avail: Univ. Microfilms Order No. 76-26032

The XY model, which describes the behavior of two-component spins interacting on a lattice, was studied. The phase transition into a low temperature phase with no long range order but with an infinite susceptibility was considered. Renormalization group transformations were constructed directly on the lattice and a cumulant expansion technique was used. On both the square and triangular lattices, a nontrivial phase transition was found in the two-dimensional classical XY model. The inverse critical temperature (in dimensionless units or spin-spin coupling constant) was 0.44 for the square lattice and 0.25 for the triangular lattice. The calculated critical exponents were approximately equal for the two cases, as expected from universality. The values of the critical exponents were 2.43 for the susceptibility, 1.38 for the correlation length, -0.76 for the specific heat, and 0.24 for the decay of the correlation function. Dissert. Abstr.

N77-13814# Illinois Univ., Urbana. Dept. of Physics.
HELICITY STRUCTURE OF THE POMERON-NUCLEON-NUCLEON VERTEX USING A MULTIPERIPHERAL MODEL
C. A. Wingate 1976 24 p refs
(Grant NSF PHYS-75-21590)

(ILL-(TA)-76-23) Avail: NTIS HC A02/MF A01

Using a version of the multiperipheral model, the Pomeron-nucleon-nucleon helicity residue functions are obtained over a wide range of t values. Pions are assumed to be exchanged along the sides of the multiperipheral ladder, and all but the lowest helicity determining loop is replaced by a Pomeron exchange. The helicity flip to nonflip ratios are found to be in good agreement with experiment while the overall normalization is less than experiment. An interesting sign structure is found in the individual flip amplitudes for the exchanged baryons. A review is also given of the current experimental status of the helicity structure of PIN and NN elastic scattering. Author

N77-13815# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

SOME ASPECTS OF THE AVERAGING EFFECTS IN MEASURED DIFFERENTIAL CROSS SECTIONS

Rudolf Dueren Dec. 1975 42 p refs

(Rept-12/1975) Avail: NTIS HC A03/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 12,45

The solving of an 11-dimensional integral for calculating the differential cross sections of particle beam interactions resulting from the averaging of theoretical cross sections is discussed. It is shown that in the case of spherically symmetric elastic interactions, the 11-dimensional integral can be reduced to a 2-dimensional one where the integrand is a product of the theoretical cross section with a distribution function of the relative velocity and the deflection angle in the center of the mass system. The distribution functions for a primary beam and a secondary beam were investigated as an application. Results for various experimental conditions (observation angles in and out of plane, widths of the beam velocity distributions, their divergence, etc.) are reported and discussed. ESA

N77-13816# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

ELECTRONIC EXCITATION BY ATOMIC COLLISIONS [ELEKTRONISCHE ANREGUNG BEI ATOMAREN STOESSEN]

Rudolf Dueren Dec. 1975 40 p refs In GERMAN Expanded version of Rept-116/1974

(Rept-14/1975; Rept-116/1974) Avail: NTIS HC A03/MF A01; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. DM 12

The Schroedinger equation is set up and discussed for atomic collisions leading to electronic excitation of one or both atoms. The essential difference with elastic (or rotation inelastic) scattering consists in the explicit incorporation of the electronic part of the total wave function. The difference with rearrangement processes is that the Hamilton operators are the same for input and output channel. ESA

N77-13817# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica

MULTIPOLE POLARIZABILITIES AND SHIELDING FACTORS OF HYDROGEN ATOM WITH HYDRODYNAMIC ANALOGY TO QUANTUM MECHANICS

G. C. Shukla and M. Barbaro 15 Nov. 1975 18 p refs Submitted for publication Partly sponsored by Ital. Res. Council

(ISS-P-75/15) Avail: NTIS HC A02/MF A01

Expressions were obtained for the multipole polarizabilities and shielding factors of the hydrogen atom with application of the time-dependent perturbation scheme developed by Wiener-Askar-Demiralp utilizing the method of hydrodynamic analogy to quantum mechanics. The expressions reduce to exact values, for zero frequency limit, as obtained by Dalgarno with usual perturbations. Author (ESA)

N77-13818# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica

LOWEST ORDER AND HYPERNETTED CHAIN CALCULATIONS OF NUCLEAR MATTER

O. Benhar, C. CiofidegliAtti (Oxford Univ.), S. Fantoni (Pisa Univ., Italy), S. Rosati (Pisa Univ., Italy), A. Kallio (Oulu Univ., Finland), L. Lantto (Oulu Univ., Finland), and P. Toropainen (Oulu Univ., Finland) 20 Mar. 1976 15 p refs

(ISS-P-76/5) Avail: NTIS HC A02/MF A01

Employing two model central interactions, the binding energy of nuclear matter was calculated within the framework of the Jastrow variational approach using different types of constraints and including all the contributions from hypernetted chain diagrams. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N77-13819 Stanford Univ., Calif.

SINGLE-BUNCH BEAM LOADING ON THE SLAC TWO-MILE ACCELERATOR Ph.D. Thesis

Roland Frederick Koontz 1976 217 p

Avail: Univ. Microfilms Order No. 76-26029

Single bunches of electrons with intensities up to 7 x 10 to the 8th power electrons per bunch are accelerated through the SLAC three kilometer accelerator, and their energy spectra are analyzed. Early experiments over a wide energy range (900 MeV to 19 GeV) demonstrated that the energy loss is proportional to the total charge in the bunch but is independent of beam energy. The average energy loss of a single bunch normalized to 10 to the 9th power electrons was initially measured to be 38 MeV. The experiments, including much of the equipment development, are described and are compared with theoretical predictions. Dissert. Abstr.

N77-13820*# Thermo Electron Corp., Waltham, Mass.

HIGH EFFICIENCY THERMIONIC CONVERTER STUDIES

F. N. Huffman, A. H. Sommer, C. L. Balestra, D. P. Briere, and P. E. Oettinger Nov. 1976 127 p refs

(Contract NAS3-19866)

(NASA-CR-135125; TE4202-12-77) Avail: NTIS HC A07/MF A01 CSCL 10B

The objective is to improve thermionic converter performance by means of reduced interelectrode losses, greater emitter capabilities, and lower collector work functions until the converter performance level is suitable for out-of-core space reactors and radioisotope generators. Electrode screening experiments have identified several promising collector materials. Back emission work function measurements of a ZnO collector in a thermionic diode have given values less than 1.3 eV. Diode tests were conducted over the range of temperatures of interest for space power applications. Enhanced mode converter experiments have included triodes operated in both the surface ionization and plasmatron modes. Pulsed triodes were studied as a function of pulse length, pulse potential, inert gas fill pressure, cesium pressure, spacing, emitter temperature and collector temperature. Current amplifications (i.e., mean output current/mean grid current) of several hundred were observed up to output current densities of one amp/sq cm. These data correspond to an equivalent arc drop less than 0.1 eV. Author

74 OPTICS

Includes light phenomena.

N77-13821 Utah State Univ., Logan.

OPTICAL CHARACTERIZATION OF THIN FILMS, AND DETERMINATION OF FOUR UNKNOWN OPTICAL PARAMETERS Ph.D. Thesis

Mohammad Reza Behfrooz 1975 122 p

Avail: Univ. Microfilms Order No. 76-25598

Transmission spectroscopy was used to study the optical and electrical properties of thin metallic and semi-conductor films. It was found that three independent transmission absorbance measurements of a thin film are sufficient for numerical inversion to determine the complex index of refraction and the thickness of that film. A computer program was used to make least-squares adjustments to the best values of the index of refraction and film thickness when more than three independent transmission

absorbance measurements are available. This enables the consistency and accuracy of the obtained results to be tested.
Dissert. Abstr.

N77-13822 Stanford Univ., Calif.
DESIGN OF A CONVOLVER FOR OPTICAL IMAGING Ph.D. Thesis
Robert Joly 1976 152 p
Avail: Univ. Microfilms Order No. 76-26021

Improvement of the airgap convolver which normally consists of a long piezo-electric bar called the delay line and an adjacent semiconductor slab spaced by a small airgap is described. A double Fourier transform experiment involving chirped signals, where the convolver achieves the first spatial Fourier transform of the image, while the inverse transform is done by a dispersive delay line is presented. By gathering the convolver output, it is possible to remove the low frequency components of the image, particularly the dark current which is the output signal when the convolver is in the dark. Dissert. Abstr.

N77-13823 Illinois Univ., Urbana-Champaign.
FAR INFRARED GUIDED WAVE OPTICS EXPERIMENTS USING A WAVEGUIDE LASER WITH A HYBRID OUTPUT MIRROR Ph.D. Thesis
Edward James Danielewicz, Jr. 1976 139 p
Avail: Univ. Microfilms Order No. 76-24062

A hybrid metal mesh-dielectric (MMD) mirror was developed for a CO2 laser pumped CW FIR waveguide laser. The MMD mirror reflectivity could be controlled independently using an inductive grid and a multilayer dielectric coating deposited on a Si substrate. With a MMD mirror the output power of a circular dielectric waveguide laser was increased by a factor of 350 times the output power using a conventional hole coupled mirror. Up to 3.2 MW of CW power were produced at lambda = 496 micron in an output beam with an EH sub 11 transverse mode profile and a minimum angular divergence of 24 mr. The laser was used to investigate the properties of anisotropic dielectric slab waveguides of crystal quartz (alpha SiO2). Dissert. Abstr.

N77-13824 Utah Univ., Salt Lake City.
TRANSMISSION, REFLECTION, AND ABSORPTION PROPERTIES OF LOSSY LAMINATED MEDIA Ph.D. Thesis
Dennis Tyson Rampton 1976 132 p
Avail: Univ. Microfilms Order No. 76-24286

The present theory is extended, and graphical aids relevant to the design and analysis of optical devices consisting of single or stacked identical parallel plates or thin films, of which interferometers, polarizers, beam splitters, optical cavities, partially transmitting mirrors, and tilted etalons are representative are developed. Absorption and arbitrary angle of incidence are incorporated in the analysis, with and without the effects of interference. A prototype thin film device consisting of an inexpensive, easily fabricated, high quality, large aperture, pile-of-plates type, infrared polarizer was constructed using films of polyethylene kitchen wrap, each film being tuned for optimum performance by stretching. A polarization constant of 98 percent, with a corresponding insertion loss of less than 20 percent, has been obtained with a polarizer composed of fifteen such films.
Dissert. Abstr.

N77-13825 Nebraska Univ., Lincoln.
INTERNAL REFLECTION ELLIPSOMETRY OF LIQUID-LIQUID INTERFACES Ph.D. Thesis
George Tanios Ayoub 1976 90 p
Avail: Univ. Microfilms Order No. 76-25856

The mathematical framework of internal reflection ellipsometry for various models applicable to characterization of the thickness and anisotropy of liquid-liquid interfaces is presented. The alignment and calibration procedures, which are different and more difficult to implement than those used for external ellipsometric study of solids, are also presented. Internal reflection ellipsometric measurements on the H2O-air CCl4-air and CCl4-H2O interfaces are consistent with the presence of an interface transition layer, an area of longstanding interest and debate in the physics and chemistry of interfaces. Initial experimental results on CCl4-H2O indicate that the relative amounts of the two constituents and the ambient temperature are of major importance in determining the magnitude of the expected anisotropy at the interface. Dissert. Abstr.

N77-13826 Washington Univ., Seattle.
A CHARACTERIZATION OF AN INTEGRATED OPTICS DIFFRACTION MODULATOR Ph.D. Thesis
John Nicholas Polky 1976 177 p
Avail: Univ. Microfilms Order No. 76-25443

An electro-optic Bragg diffraction modulator for optical waveguides was characterized by considering: (1) the attenuation of guided waves by metal electrodes, (2) the electro-static fields of an interdigital electrode structure, (3) a nonuniform distribution of refractive index change within the waveguide, and (4) inter-polarization diffraction. A more general four-material system was considered consisting of a substrate, guiding layer, superstrate, and low index isolation layer between the guide and the electrodes. A coupled-mode model was used to describe the diffraction intensities in the modulator output. The guided wave attenuation properties, due to metal electrodes, were studied by numerical evaluation of the eigenvalue equation. General techniques used to determine the propagation constants of multi-layered structures for different attenuation magnitudes are discussed. Important design parameters; such as type of metal, isolation layer thickness, and isolation layer refractive index were considered for both TE and TM polarized waves.
Dissert. Abstr.

N77-13827 Nebraska Univ., Lincoln.
STUDY OF THE ELLIPSOMETRIC FUNCTION OF A FILM-SUBSTRATE SYSTEM AND APPLICATIONS TO THE DESIGN OF REFLECTION-TYPE OPTICAL DEVICES AND TO ELLIPSOMETRY Ph.D. Thesis
Abdel-Rahman Mohamed Abdalla Zaghloul 1975 233 p
Avail: Univ. Microfilms Order No. 76-25910

The ellipsometric function is investigated as the angle of incidence phi and film thickness d are varied for an optically isotropic film-substrate system. A unified scheme for the design of all reflection type optical devices is presented. A novel polarizer surface analyzer (PSA) null ellipsometer is described that can be used to characterize film substrate systems provided the film thickness lies within a permissible an inversion procedure of the nonlinear equations of reflection ellipsometry that separates the determination of the optical constants (refractive indices and extinction coefficients) of the film and substrate from the film thickness is derived. Dissert. Abstr.

N77-13828+ Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
PASSIVE COMPONENTS FOR OPTICAL MULTIMODE COMMUNICATION Final Report [COMPOSANTS PASSIFS POUR COMMUNICATIONS OPTIQUES MULTIMODES]
L. d'Auria, A. Jacques, J. Dubos, P. Maillot, and C. Moronvalle Oct. 1975 47 p ref In FRENCH
(Contract DGRST-74-7-0930)
(LCR-75-198/R/G5) Avail: NTIS HC A03

The development of 3 dB shunts and detachable connectors between fiber optics links using a monofiber mixer as intermediary part is reported. A mathematical model of the link-link coupling was established taking into account connection losses. Experiment and theory compared well. A technique was also developed for hot deformation of an optical fiber, and the losses of the component were measured (approximately 1 dB). ESA

N77-13829+ Ecole Superieure de Physique et de Chimie Industrielles, Paris (France). Lab. de Resonance Magnetique.
DEVELOPMENT OF OPTICAL FREQUENCY CONVERTER AND ITS USE IN HIGH RESOLUTION SPECTRAL ANALYSIS
J. Leblond, P. Papon, and M. Zaremedwitch May 1975 22 p In FRENCH; ENGLISH summary
(Contract DGRST-73-7-1613)
Avail: NTIS HC A02

A device was realized to perform frequency modulation of light with an acousto-optic effect. It allows a shifting of optical frequencies which varies continuously from 100 to 300 MHz. This apparatus has been used to perform high-resolution spectral analysis: Rayleigh light-scattering - Doppler effect measurements. It avoids using an RF spectrum analyzer. Systematic studies of

ultrasonic attenuation in crystals were performed in the 100 MHz to 10 GHz range. They reveal that in some crystals this attenuation no longer varies as omega (square) at high frequencies.
Author (ESA)

N77-13830# European Space Agency, Paris (France).
LARGE INFRARED TELESCOPE ON SPACELAB (LIRTS). REPORT ON PHASE A STUDY
19 May 1976 76 p
(ESA-DP/PS(76)-18) Avail: NTIS HC A05/MF A01

The IR telescope is a 3 m class Cassegrain-type configuration with uncooled optics. Modulation is provided by rocking the secondary mirror. Its suggested focal plane instrumentation consists of a multiband photometer, a polarimeter, a Michelson interferometer, and a heterodyne receiver allowing for multiband mapping and polarimetry, as well as high and very high resolution spectroscopy. ESA

N77-13831# European Space Agency, Paris (France).
NASA-ESA COOPERATION ON ST. THE FAINT OBJECT CAMERA AND OTHER ELEMENTS. REPORT ON THE PHASE A STUDY
31 May 1976 62 p
(ESA-DP/PS(76)-19) Avail: NTIS HC A04/MF A01

ESA's contribution to the NASA 2.4 m Space Telescope (ST) program is described. The ST will be launched by the shuttle into a low earth orbit of height 500 to 610 km and inclination 28.8 degs. It is foreseen that ESA may contribute and develop in Europe the faint object camera and the associated imaging photon counting system. In addition it is proposed that ESA should provide the solar arrays and participate in the operations of ST while in orbit. ESA

N77-13832# Zeiss (Carl), Oberkochen (West Germany).
PLANE DIELECTRIC WAVEGUIDES: TEST METHODS AND APPLICATIONS Final Report
Reimund Torge and Heinz Sprongl Bonn Bundesmin. fuer Forsch. u. Technol. Jun. 1976 47 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol. (BMFT-FB-T-76-24; BMFT-NT-364) Avail: NTIS HC A03/MF A01; ZLDI, Munich, DM 9.45

Experimental and theoretical investigations were carried out concerning the problem of accuracy and behavior of the computer algorithm associated with the evaluation of refractive index and thickness of light-guiding multimode films. New methods for dispersion and thickness measurement of thin monomode and very thin non-light-guiding films were developed. Fundamental problems, such as sensitivity and reproducibility of thin film spectroscopy with light-guiding film, are also dealt with.
Author (ESA)

N77-13833# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PREDICTED AND MEASURED DETECTION CAPABILITIES OF THE LINCOLN ETS, PHOTON-NOISE-LIMITED, ELECTRO-OPTICAL SYSTEMS
Robert Weber 26 Apr. 1976 64 p refs
(Contract F19628-76-C-0002; AF Proj. 2128)
(AD-A025859; TN-1976-9; ESD-TR-76-98) Avail: NTIS HC A04/MF A01 CSCL 17/8

A model describing the GO-point source detection capabilities of low-light-level, photon-noise-limited, electro-optical systems operating at standard television rates has been extended to include image integration within the sensor (intensified silicon diode target). Specific examples have been calculated for 0.4 deg - 0.7 deg fields of view, for 14 in. - 31 in. telescope apertures, for 5C - 20C temperatures, for 17m - 22m per sq. sec night-sky-brightnesses, and for several specified video signal-to-noise ratios. Author (GRA)

N77-13834# Vought Corp., Sterling Heights, Mich.
TARGET AND BACKGROUND SIGNATURE TEST PROGRAM Final Report
L. A. Monicatti Apr. 1976 74 p
(Contract DAAH01-75-C-0533)
(AD-A025822; Rept-7-52100/6R-9) Avail: NTIS HC A04/MF A01 CSCL 17/5

The objectives of this program were to: (a) design and fabricate the necessary hardware, and (b) conduct a test program to obtain the infrared signature data characteristics of various targets and backgrounds. The data were obtained through the use of different types of infrared seekers and/or sensors from the overhead aspect employing a U.S. Army UH-1 type helicopter. Subsequent analysis of the data determined the characteristic signatures of the various targets and backgrounds from the vertical hemisphere. The program was a joint effort between the Vought Corporation Michigan Division, the U.S. Army Missile Command (MICOM), and the U.S. Army Tank and Automotive Command (TACOM). Testing was divided into two phases that were arranged to address various environmental aspects pertaining to various ground terrains, geographical locations, and climatic and seasonal characteristics of the target and background signatures. The two phases were: (a) Southern phase - These tests were conducted at Redstone Arsenal, Alabama in the September - October timeframe. (b) Northern phase - These tests were conducted at Grayling, Michigan in January. The southern test series yielded data against a medium temperature, cool grassy field background while the northern test series provided data obtained against a severe winter/snow background. GRA

N77-13835# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
INVESTIGATIONS OF A GOGGLE DESIGN UTILIZING HOLOGRAPHIC ELEMENTS Final Technical Report, 6 Nov. 1974 - 6 Dec. 1975
Willis S. Colburn Jan. 1976 137 p refs
(Contract DAAK02-75-C-0056; DA Proj. 1S7-63719-DK-70)
(AD-A025146; ERIM-112200-3-F) Avail: NTIS HC A07/MF A01 CSCL 20/6

The subject of this report is a preliminary design effort to develop a one-tube, two-eye goggle utilizing holographic optical elements. The major objective of this effort was to determine the feasibility of using holographic optics in a goggle system with its requirements of wide field-of-view, high efficiency, and good image quality. Because of the dispersive nature of holograms, holographic lenses operate best over a narrow band of wavelengths; for the goggle application, therefore, holographic elements were considered only for the portion of the optical train following the image intensifier. In the course of this design effort, nine variations of a basic system configuration were evaluated in terms of imaging criteria, aberrations, and efficiency. Two designs that showed promise were studied in detail. One was an all-holographic design attractive in its simplicity, but having inadequate optical performance. A more complex hybrid system comprising two holographic lenses and two conventional lenses was characterized by better optical performance and high efficiency. It is recommended that in addition to further design studies, a laboratory version of the Hybrid Design be assembled and tested. Author (GRA)

N77-13836# Metavac, Inc., Flushing, N.Y.
PRODUCTION ENGINEERING MEASURES FOR FILTER, INFRARED, INTERFERENCE-ABSORPTION TYPE Quarterly Report, 1 Dec. 1975 - 28 Feb. 1976
John Monte 28 Apr. 1976 18 p refs
(Contract DAAB07-74-C-0379)
(AD-A025366; QR-7) Avail: NTIS HC A02/MF A01 CSCL 17/5

Five additional First Article Filters were manufactured and assembled using the approved Manufacturing Process. These were submitted to some but not all tests specified. No failures were encountered. Field tests involving the use of a 1,000 Meter test range belonging to a searchlight manufacturer were slightly delayed due to the requirement of a clear night with no moonlight. Some Angular Visual Security tests were conducted when the test range became available. Consolidation of angles observed and calculated Figures of Merit on one graph show that a specific trend line and linear equation of relation between these two characteristics have emerged for Filters manufactured using the approved process. GRA

N77-13974 European Space Agency, Paris (France).
DEVICE FOR ULTRASONIC TRANSPARENCY VISUALIZATION OF THIN PARTS BY BRAGG DIFFRACTION
Bernard Baerd, Michel Billard, Jean-Claude Guinot, Roger Jean et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-2 (ESA-TT-352) Nov. 1976 p 99-141 refs Transl. into ENGLISH

from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. 1976 p 109-126 Original report in FRENCH previously announced as A76-33747 (For primary document see N77-13970 04-99)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N77-13837 Princeton Univ., N.J.
FINITE BETA EFFECTS ON LOW-FREQUENCY INSTABILITIES IN AXISYMMETRIC TORUS Ph.D. Thesis
Barry Stephen Newberger 1976 137 p
Avail: Univ. Microfilms Order No. 76-23869

A formalism for the study of low-frequency modes in a plasma including the effects of nonzero beta was developed. A multiple scale length expansion was used and thus finite gyro-radius and finite banana orbit effects are treated. The geometry is a general axisymmetric one, with shear, but attention is focussed on a geometry of the tokamak type. Several problems related to finite beta were studied. Trapped particle modes were considerd with regared to the generation of Alfven waves for both the collisionless and collisional modes. The latter are treated by a Krook model with collision frequency enhanced by the aspect ratio to account for scattering in pitch angle of the trapped particles. Dissert. Abstr.

N77-13838 Texas Univ., Austin.
DYNAMICS OF MAGNETIC FIELD PENETRATION INTO A WEAKLY IONIZED PLASMA Ph.D. Thesis
Spencer Jackson Marsh 1976 116 p
Avail: Univ. Microfilms Order No. 76-26665

The penetration of a fast rising magnetic pulse into an initially unmagnetized, weakly ionized plasma is investigated. Initial results indicate that the magnetic field moves into the plasma at a velocity that scaled as the Alfven velocity but was significantly larger. The magnetic field penetrates at a velocity inversely proportional to the neutral filling density. Magnetic probe data was analyzed using a magnetohydrodynamic approach to obtain detailed information about the dynamics of the penetration mechanism. The local resistivity and collision frequency obtained from this data compare favorably with theoretical estimates of turbulent collision frequencies. The data indicates that sufficient energy is absorbed to heat the bulk of the plasma to temperatures in excess of 1 KeV. Dissert. Abstr.

N77-13839 Texas Univ., Austin.
THEORETICAL STUDIES OF ION ACOUSTIC TURBULENCE AND ITS MACROSCOPIC EFFECTS ON PLASMA BEHAVIOR Ph.D. Thesis
Robert Allen Koch 1976 68 p
Avail: Univ. Microfilms Order No. 76-26651

A renormalized theory of plasma turbulence is applied in the study of the current driven ion acoustic instability. The resulting set of equations is suitably reduced in order to follow the development of the instability through the nonlinear stages. The results of a numerical calculation based upon this analysis are presented for a wide range of the relevant parameters. The dependence of collision frequency, electron heating, suprathermal ion production, etc., on the ion mass, electron drift velocity, etc., are obtained from these results and explained in terms of the behavior of an average unstable wave. Dissert. Abstr.

N77-13840 Princeton Univ., N.J.
PARAMETRIC INSTABILITIES AND ELECTROSTATIC ION-CYCLOTRON WAVES IN MULTISPECIES PLASMAS Ph.D. Thesis
Jacob Leser Sperling 1975 146 p
Avail: Univ. Microfilms Order No. 76-23814

The cyclotron decay instability excited by a magnetosonic pump in a multispecies plasma is discussed in detail in homogeneous and inhomogeneous plasmas and its potential as a source of ion heating is ascertained. The analysis of the cyclotron decay instability is introduced in which the reasons for studying the instability and the basic plasma model used for the calculations are discussed. The important physical features of the instability are summarized. Parametric instabilities excited by a magnetosonic pump wave in an infinite, homogeneous, multispecies plasma are considered. The decay instability into two electrostatic ion-cyclotron waves (cyclotron decay instability) has the lowest threshold. Dissert. Abstr.

N77-13841 Tennessee Univ., Knoxville.
ON THE NATURE OF FLUCTUATIONS IN AN OPEN CYCLE MAGNETOHYDRODYNAMIC GENERATOR Ph.D. Thesis
Mary Hall Scott 1976 170 p
Avail: Univ. Microfilms Order No. 76-24858

Several parameters considered to be of importance in the MHD generator were measured over a bandwidth large enough to encompass all significant frequency contributions. The first parameter measured was a signal proportional to the filtered plasma radiation and has significance in its relation to plasma temperature. The other parameters were all differential voltages measured between various electrodes in the generator but were obtained under different conditions. All the measured signals were analyzed within the framework of random process theory so that their respective time and frequency resolved behavior could be ascertained. On the basis of theoretical considerations, three models are advanced to describe the behavior observed experimentally. The relationships between the experimental and theoretical influences are discussed. Dissert. Abstr.

N77-13842*# Colorado State Univ., Fort Collins. Dept. of Physics.
INTERACTION OF A SOLAR ARRAY WITH AN ION THRUSTER DUE TO THE CHARGE-EXCHANGE PLASMA Annual Report
Harold R. Kaufman Oct. 1976 62 p refs
(Grant NsG-3038)
(NASA-CR-135099) Avail: NTIS HC A04/MF A01 CSCL 20I

The generation of a charge exchange plasma by a thruster, the transport of this plasma to the solar array, and the interaction of the solar array with the plasma after it arrives are all described. The generation of this plasma is described accurately from thruster geometry and operating conditions. The transport of the charge exchange plasma was studied experimentally with a 15 cm thruster. A model was developed for simple thruster array configurations. A variety of experiments were surveyed for the interaction of the plasma at the solar array. Author

N77-13843# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
HYDROGEN AND HELIUM DENSITY PROFILES IN A STEADY-STATE GAS-BLANKET REACTOR Ph.D. Thesis - Utrecht State Univ.
J. A. Markvoort Nov. 1975 112 p refs Sponsored in part by Neth. Organ. for Pure Sci. Res. (ZWO) and EURATOM
(Rept-75-91) Avail: NTIS HC A06/MF A01

The behavior of the plasma in the reactor, consisting of electrons, a 50/50 deuterium-tritium mixture, and helium, is described by the multi-fluid MHD equations. The set of equations differs from the usual ones in one important aspect as the thermo-electric forces arising from both electron-ion and ion-ion collisions are taken into account. The equations are numerically solved with the aid of a Runge Kutta method. The formula of Braginskii for the so-called Nernst effect, which only considers the electron-ion collisions is generalized to include collisions between ions with arbitrary charges and masses. In this generalized cylindrical model realistic nuclear parameters are found in which stationary solutions are possible. The supply of the thermonuclear fuel, the deuterium-tritium ions, and the removal of the reactor ash, the helium ions, is effected by diffusion. Numerically as well as analytically, it is shown that the influence of the thermoforce due to ion-ion collisions on the density profiles is larger than the force due to the electron-ion collisions. Another extension of the cylindrical model of the reactor was made by assuming that anomalous transport coefficients can be present. The effect of the axial electric field and of anomalous transport coefficients on the temperature and density profiles were studied. The size of the parameter region in which solutions are then found to be possible proves very sensitive to the coefficient for heat conductivity. Case studies were made to evaluate the effect

of the Nernst thermoforce on simple hydrogen arcs, which are ohmically heated. Infinitely high belt configuration with axial symmetry was investigated as substitute for a torus.
Author (ESA)

N77-13844# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
EXPERIMENTS ON TOROIDAL INDUCTIVELY COUPLED ALTERNATING-CURRENT GAS DISCHARGES Ph.D. Thesis - Utrecht State Univ.
J. Lok Mar. 1976 88 p refs Sponsored in part by Neth. Organ. for Pure Sci. Res. (ZWO) and EURATOM
(Rept-76-94) Avail: NTIS HC A05/MF A01

The discharges studied were sustained at pressures roughly between one tenth of a torr and some tens of torrs. After breakdown was obtained at low pressure, additional gas was let in from a reservoir. The energy was inductively coupled into the electrodeless discharge by means of an iron core transformer of which the toroidal plasma column was the secondary winding. The power dissipated in the plasma was between 80 and 260 kW and was delivered by a motor-generator system at a frequency of 8 kHz for times up to 2 sec. The matching of the impedance of the generator and that of the plasma transformer was obtained by means of an autotransformer and capacitors. A toroidal magnetic field of 0.5 T maximum can be supplied in a short pulse. Five difference gases (hydrogen, deuterium, helium, argon, and nitrogen) were used. The pressure range in which the discharges were sustained is specified and the dynamic current-voltage characteristics are given for different pressures. Some typical streak pictures with simultaneously obtained recordings of the time behavior of the discharge current and of the loop voltage are presented for the initial phase (at low pressure) of the discharge. The shape and position of fully developed discharges at various pressures are discussed on the basis of photographic observations. The temperature of hydrogen plasmas is derived both from the electrical conductivity and from the emission of line radiation. The values of the temperature obtained in these ways differ in magnitude and in time behavior. A possible explanation of the discrepancy can be obtained in terms of expansion and contraction of electron density and temperature profiles during a period of the discharge current. This picture is confirmed by microwave measurements. Author (ESA)

N77-13845# Air Force Geophysics Lab., Hanscom AFB, Mass.
RESISTIVITY OF DENSE COPPER VAPOR Physical Sciences Research Papers
A. G. Rubin 5 Apr. 1976 16 p refs
(AF Proj. 8600)
(AD-A024933; AFGL-TR-76-0067; AFGL-PSRP-657) Avail: NTIS HC A02/MF A01 CSCL 20/9

Using exploding wire techniques the resistivity of copper is measured as a function of current density. A linear relationship between log resistivity and log current density is found in the classical plasma region. This region includes electron densities up to 10 to the 21st power per co. Above this, the material is a quantum liquid or plasma. Author (GRA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N77-13846 Emory Univ., Atlanta, Ga.
X-RAY CRYSTALLOGRAPHIC DIFFRACTION STUDIES OF ORGANIC MOLECULES Ph.D. Thesis
Diana Marshall Faulkner 1976 161 p
Avail: Univ. Microfilms Order No. 76-25072

Single crystal X-ray diffraction studies of the salt tetrapropylamine 2,3-dichloro 5,6-dicyanobenzoquinone, methoxysewarine N-4-methiodide, choleic acid complex of deoxycholic acid and 6-iodohexanoic acid, and tetraphenyl-alpha-pyrone are presented. An introduction giving historical perspective and explaining interest in the compound is included, along with a discussion of the experimental procedure and crystallographic methods used. The crystal structure of tetrapropylamine 2,3-dichloro 5,6-dicyanobenzoquinone is discussed in terms of bond distances and angles and molecular packing, and is compared to similar benzoquinones whose crystal structures are known.
Dissert. Abstr.

N77-13847 British Library Lending Div., Boston Spa (England).
BEHAVIOUR OF THE K ALPHA-DOUBLET IN DOUBLE CRYSTAL REFLECTION. PART 1: CALCULATION, DISCUSSION AND TESTING OF REFLECTION CONDITIONS
H. Jaeger 21 Jul. 1976 19 p refs Transl. into ENGLISH of Z. fuer Angew. Physik (West Ger.) v. 20, no. 1, 1965 p 73-79
(BLL-Trans-3365-(9022.81)-Pt-1) Avail: British Library Lending Div., Boston Spa, Engl.

The condition for double crystal X-ray reflection is calculated, i.e. those crystal zones are sought out, which fulfull the conditions for twofold reflection at two crystals. More general, but so far less attended case, of reflection at two lattice planes with different lattice plane distances is treated. In this case, a marked splitting of the K sub alpha doublet is observed. The measurement of the doublet line distance in dependence of the most important direction parameter (n sub 2z) confirms the approximations introduced into the calculation. Author

N77-13848 British Library Lending Div., Boston Spa (England).
ON THE INTERDEPENDENCE BETWEEN THE GRANULOMETRIC COMPOSITION OF ZINC-CADMIUM SULPHIDE PHOSPHOR POWDERS AND THE DEGREE OF DISPERSION OF INITIAL ZINC AND CADMIUM SULPHIDES
L. Ya. Markovskii, L. B. Taushkanova, V. F. Gladkova, and Yu. D. Kondrashev 21 Jun. 1976 7 p refs Transl. into ENGLISH from Zh. Priklad. Khim. (USSR), v. 46, no. 7, Jul. 1973 p 1430-1435
(BLL-Trans-920-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.

Zinc-cadmium sulfide phosphors activated with silver are studied. These phosphors were prepared by calcinating 30g of the charge in crucibles. The degree of dispersion of the initial sulfide powders was characterized by specific volume in millimeters per lg or by the percentage content of particles of a given size as determined on sedimentation scales. The electron microscopic investigation was carried out using the carbon imprints method. The replicas were photographed in an electron microscope EM-3 under an accelerating voltage of 50 kV; the total magnification was 15,000. X-ray phase analysis was carried out on a diffractometer Dron-1. Author

N77-13849 British Library Lending Div., Boston Spa (England).
PHYSICS OF SOLIDS: THEORETICAL DETERMINATION OF THE ENERGY DISTRIBUTION CURVE OF SECONDARY ELECTRONS EMITTED BY AN INSULATION
P. Duboin, L. Touzillier, C. Scouarnec, and J. Bandet 23 Sep. 1975 5 p refs Transl. into ENGLISH from Compt. Rend. (Paris), no. 273, series B, 13 Oct. 1971 p 733-736
(BLL-Trans-918-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.

A Monte Carlo method is used to simulate the phenomenon of transport of secondary electrons inside a magnesium oxide crystal. The theoretical energy distribution curve is derived.
Author

N77-13850 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF THE HALL FACTOR AND OF THE IMPURITY BAND CONDUCTION IN n-TYPE GaAs
A. Freiser 10 Sep. 1975 11 p refs Transl. into ENGLISH from Exp. Tech. Phys. (Berlin), v. 22, no. 4, 1974 p 273-282
(BLL-Trans-924-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.

The magnetic field dependence of the Hall coefficient was investigated for n type GaAs samples with carrier concentrations of 3 to 7.10 to the 15th power cu cm. The Hall factors found can be explained taking into account the scattering of carriers by inhomogeneities. For the electron mobility in the impurity band values of 400 to 500 sq cm/Vs values were obtained. A model is proposed for the interpretation of these high mobilities. Author

N77-13851 British Library Lending Div., Boston Spa (England).
BEHAVIOUR OF ELECTRICAL CONDUCTIVITY OF EPITAXIAL ZnO FILMS DURING CHEMISORPTION OF ATOMS AND MOLECULES OF NITROGEN AND OXYGEN
N. N. Govorunov, V. A. Sokolov, V. V. Styrov, B. G. Urusov, and A. M. Bagamadova 6 Oct. 1975 6 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Fiz. (Tomsk), no. 8, 1974 p 93-97
(BLL-Trans-922-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.

The behavior of electrical conductivity of epitaxial films of zinc oxide in an atmosphere of atoms and molecules of nitrogen and oxygen are investigated with the aid of a bridge circuit. The results are discussed taking into consideration some heterogeneous chemical processes accompanied by exchange of carriers between the surface and the volume of a solid body.
Author

N77-13852 Oklahoma Univ., Norman.
THE MOLECULAR DIPOLE MODEL AND THE INTERNAL OPTIC MODES OF THE SULFATE ION IN DIFFERENT CRYSTALLINE SYSTEMS Ph.D. Thesis
Guo-Jen Wu 1976 149 p
Avail: Univ. Microfilms Order No. 76-24395

The internal optic modes of the sulfate ion in different crystalline systems were studied utilizing a molecular dipole model. The model describes the vibrational dynamics of these modes in terms of the vibrationally induced dipolar coupling of the constituent ions and permits the calculation of several important molecular properties. The electronic polarizability components of the sulfate ion in LiKSO4, KNaSO4, Na2SO4, K2SO4, and K2Mg2 (SO4)3 are calculated from the optical refractive indices using the point dipole model. The values obtained are discussed in terms of the immediate crystalline environment of the sulfate ion. The frequencies of the transverse and longitudinal internal optic modes were measured by polarized Raman scattering experiments and estimated from near-normal incidence reflectivity spectra. Dissert. Abstr.

N77-13853 Louisville Univ., Ky.
MOLECULAR COMPLEXES OF ANTIMONY TRICHLORIDE WITH AROMATIC COMPOUNDS CONTAINING CARBONYL FUNCTIONAL GROUPS: A CRYSTALLOGRAPHIC STUDY Ph.D. Thesis
William Abel Baker 1976 129 p
Avail: Univ. Microfilms Order No. 76-26197

X-ray crystallographic studies of antimony trichloride molecular complexes with aromatic compounds containing carbonyl functional groups are presented. Crystal structure, final R factor, and coordination with oxygen atoms are described for terephthaldehyde, diacetylbenzene, and triacetylbenzene. Dissert. Abstr.

N77-13854 Wayne State Univ., Detroit, Mich.
THE ELECTRON SPIN LATTICE RELAXATION OF RADIATION PRODUCED TRAPPED ELECTRONS AND TRAPPED HYDROGEN ATOMS IN GLASSY MATRICES Ph.D. Thesis
Michael Keith Bowman 1975 161 p
Avail: Univ. Microfilms Order No. 76-26113

The electron spin lattice relaxation rate of radiation produced trapped electrons and trapped hydrogen atoms in glassy matrices was studied as a function of temperature between 6K and 130K at 9.2 GHz. The matrices studied were sodium hydroxide ice, ethanol, methanol, 2-methyltetrahydrofuran (MTHF) and 85% phosphoric acid. Trapped electrons in sodium hydroxide and trapped hydrogen atoms in phospheric acid exhibit relaxation rates which can be described by a cross relaxation process, a new relaxation process involving sodium and phosphorus nuclei respectively, and an unidentified process with an exponential temperature dependence. Trapped electrons in ethanol and MTHF showed similar behavior except that cross relaxation was absent and the new relaxation process involved hydrogen nuclei.
Dissert. Abstr.

N77-13855 Stevens Inst. of Tech., Hoboken, N.J.
AN EXPERIMENTAL INVESTIGATION OF CRYSTALLIZATION RATES FOR DEFORMED POLYBUTENE-1 MELTS AND CHARACTERIZATION OF THE RESULTING MORPHOLOGY Ph.D. Thesis
Anthony Wereta, Jr. 1976 158 p
Avail: Univ. Microfilms Order No. 76-25171

A deformation dilatometer was designed and built for the purpose of investigating crystallization rates in deformed polymer melts. A sliding plate arrangement is used to apply stepwise shear strains to supercooled polybutene-1 melts which are isothermally crystallized at 90 and 95 deg C. The results show that stepwise shear causes oriented crystallization when shear rates are sufficiently high. Nucleation rates dramatically increase as induction times vary from several minutes (quiescent crystallization) to less than a second. Wide angle X-ray scattering confirmed cystalline orientation and indicated that the form 2 form 1 transformation rate had increased. No evidence was found for residual strains in completely crystallized samples. Dissert. Abstr.

N77-13856 Delaware Univ., Newark.
THE BARKHAUSEN EFFECT IN FERROMAGNETIC CONDUCTORS Ph.D. Thesis
Paul Joseph Coyne, Jr. 1976 161 p
Avail: Univ. Microfilms Order No. 76-24238

Models available to characterize the Barkhausen effect are discussed. The effects of material parameters and equipment characteristics on the form of the Barkhausen pulses observed are investigated. Single crystal sheets of 3 percent silicon-iron with the cube face exposed serve, as the test material. A method of experimentally determining the electrical parameters of the search coil was used to observe the Barkhausen pulses. This information, as well as the bandwidth characteristics of the equipment used, allows the consideration of bandwidth limitations on pulse shape. The origin of the negative Barkhausen effect is explained in terms of bandwidth limitations. Dissert. Abstr.

N77-13857 Princeton Univ., N.J.
STUDY OF LATERAL NONUNIFORMITIES AND INTERFACE STATES IN MIS STRUCTURES Ph.D. Thesis
Ching-chu Chang 1976 139 p
Avail: Univ. Microfilms Order No. 76-23827

Methods for distinguishing between lateral nonuniformities and interface states in MIS structures and for characterizing lateral nonuniformities when these are determined to be present were studied. A simple, approximate method is presented for determining the distribution of flat-band voltages in a nonuniform MIS capacitor, which uses only the measured quasi-static high-frequency C-V curves of the structure. A more exact method based on use of the Fast Fourier Transform technique is also proposed. Methods are proposed for distinguishing between interface states and lateral nonuniformities which are based respectively on the frequency dependence of interface-state capacitance and on the temperature dependence of both minority-carrier generation and emission from interface states. Experimental results are presented to show the feasibility of these methods. Dissert. Abstr.

N77-13858 Princeton Univ., N.J.
A STUDY OF DOUBLE INJECTION AND NEGATIVE RESISTANCE IN PLANAR, GOLD-DOPED SILICON DIODES Ph.D. Thesis
Peter Manus ZeitZoff 1976 460 p
Avail: Univ. Microfilms Order No. 76-25124

When a semiconductor P+ -Intrinsic-N+ diode (termed a P+-I-N+ diode) was biased in the forward direction, double injection into the intrinsic region was achieved, i.e., holes were injected from the P+ region and electrons were simultaneously injected from the N+ region. If one of these species of carrier was preferentially captured by deep centers in the intrinsic region, the low-level current-voltage (I-V) characteristic was essentially that of a single carrier and the voltage required for a given current was comparatively large. An increase in the level of injection resulted in filling of the centers, and space-charge neutralization between the two species of carriers resulted in a high-current, low-voltage regime in the I-V characteristics. Between the two regimes was a region of current-controlled electronic negative resistance. Dissert. Abstr.

N77-13859 Princeton Univ., N.J.
CORRELATION OF ATOMIC AND ELECTRONIC STRUCTURE OF GaAs (100) SURFACES Ph.D. Thesis

Ying Kuen Shum 1975 140 p
Avail: Univ. Microfilms Order No. 76-23813

The structure of GaAs (100) surfaces was studied using LEED and Auger electron spectroscopy. Auger spectra indicate a preferential termination, either Ga or As rich, after surface preparation by argon ion bombardment and annealing to between 400 and 450 C. LEED studies resulted in the identification of two distinct surface reconstructions namely a (4 x 2) and (3 x 2) structure. The structures were obtained by appropriate annealing sequences and were found to be stable at room temperature. The electrical properties of the (4 x 2) reconstructed surfaces were characterized by the Kelvin probe technique and photoemission experiments. Dissert. Abstr.

N77-13860 Stanford Univ., Calif.
LOCAL AND NONLOCAL EFFECTS IN THE PENETRATION OF MAGNETIC FIELDS INTO SUPERCONDUCTING TIN FILM CYLINDERS Ph.D. Thesis
Edward George Wilson 1976 159 p
Avail: Univ. Microfilms Order No. 76-26091

The temperature dependence is measured of magnetic field penetration into superconducting tin films, some of which may be fitted with a local theory, and others show distinctly nonlocal effects. Reversed fields were not found inside any of the superconducting tin cylinders, and a mechanism was discovered which could explain the implausibly large field reversal.
Dissert. Abstr.

N77-13861 Illinois Univ., Urbana-Champaign.
ACCEPTOR BEHAVIOR OF IMPLANTED BERYLLIUM IN GALLIUM ARSENIDE AND GALLIUM ARSENIDE PHOSPHIDE Ph.D. Thesis
Pallab Kumar Chatterjee 1976 189 p
Avail: Univ. Microfilms Order No. 76-24056

Photoluminescence and electrical measurements were performed on Be-implanted GaAs and GaAs(1-x)Px(x approximately equal to 0.38). The temperature dependence of the peak emission energy and the intensity of the emission were made. The effects of annealing with SiO2 and Si3N4 encapsulation on electrical and optical behavior were studied. Hall effect and resistivity measurements were made on implanted GaAs and GaAs(1-x)Px as a function of anneal temperature. Various techniques were also used to obtain the distribution of implanted Be after the anneal. Red light emitting junctions fabricated by Be implantation in GaAs(1-x)Px were also studied. The effect of various acceptor profiles on the performance of such light emitting junctions was examined. The results obtained during these studies indicate that Be is a useful acceptor for implantation doping of GaAs and GaAs(1-x) for fabrication of devices requiring controlled profiles, good electrical activation, and efficient luminescence.
Author

N77-13862 Virginia Univ., Charlottesville.
EFFECT OF STRAIN ON THE FERROMAGNETIC DOMAIN AND DOMAIN WALL STRUCTURE OF SINGLE CRYSTAL (100) NICKEL FILMS Ph.D. Thesis
George Robert Proto 1976 311 p
Avail: Univ. Microfilms Order No. 76-25020

The effect of elastic strains due to externally applied stresses on ferromagnetic domains and domain wall structure and width is studied both theoretically and experimentally. It is shown that the total strain is not necessarily equal to the sum of the magnetostriction and the elastic strain in the absence of an applied magnetic field unless the magnetostriction is assumed to be linear. Thereafter, expressions for the exchange energy, anisotropy energy, domain wall energy and width, and easy direction of magnetization in the presence of an external plane stress are derived. The above results are confirmed experimentally in a qualitative way for single crystal nickel films strained by the presence of an epitaxial overlayer or by radiation damage due to large doses of He ions at 30 kV. Dissert. Abstr.

N77-13863 Virginia Univ., Charlottesville.
RADIO FREQUENCY MEASUREMENTS ON A SUPERCONDUCTING RING CONTAINING A SINGLE WEAK LINK Ph.D. Thesis
Robert Rifkin 1976 91 p
Avail: Univ. Microfilms Order No. 76-25025

An accurate measurement of the pair quasiparticle interference term of the Josephson equations was made. These experiments were performed using a standard RF SQUID circuit consisting of a niobium point contact weak link incorporated into a superconducting ring which was coupled to a tank circuit. A toroidal configuration was used for the superconducting ring in order both to minimize its inductance and to shield it from extraneous fields. The tank circuit was driven by an RF oscillator near its resonant frequency approximately 30 Mhz.
Dissert. Abstr.

N77-13864 Pittsburgh Univ., Pa.
A NUMERICAL SOLUTION OF THE ANISOTROPIC THERMAL DIFFUSION EQUATION WITH EXPERIMENTAL VERIFICATION Ph.D. Thesis
Lawrence Saroff 1976 249 p
Avail: Univ. Microfilms Order No. 76-21797

Saul'yev's, alternating direction explicit procedure (ADEP) is extended for mixed partial derivatives and, hence, the solution of the anisotropic diffusion equation. Consistency criteria of the extended ADEP, applied to the anisotropic diffusion equation, is demonstrated. Temperature distribution in a two-dimensional anisotropic medium, new to the literature, are presented. An experimental procedure is developed, using liquid crystals as a temperature measuring device, to map the temperature distribution on the surface of a solid. Liquid crystal color variation with temperatures are calibrated to within. 1 C. Using variable heat flux at a boundary for short times in the vicinity of ambient conditions under a vacuum, the heat losses have been reduced to less than 4%. A computer simulation, based upon the numerical procedure developed, is used to calculate temperature distributions at conditions identical to the experimental runs. A sensitivity analysis is presented which converts the uncertainties in the calibrations of the liquid crystal colors variation with temperature, and the thermal diffusivity of quartz, to a band of probable error around each calculated temperature isotherm.
Dissert. Abstr.

N77-13865 State Univ. of New York, Buffalo.
MANY-BODY STUDY OF PAIR CORRELATIONS AND ELEMENTARY EXCITATIONS IN THE INTERACTING BOSE SYSTEM Ph.D. Thesis
Thaddeus V. Samulski 1976 96 p
Avail: Univ. Microfilms Order No. 76-26561

The many-body formulation of the interacting Bose system is investigated. The nature of the interaction between the interacting bosons is two-particle only and can be Fourier transformed. The equilibrium properties of the system are then calculated by using the pair distribution function. The pair distribution function was calculated using a chain diagram approximation, and from this function the long-range nature of the correlations between particles was investigated. When Bose-Einstein condensation takes place, the long-range correlations are algebraically decreasing, however, in a way that is more rapid than the ideal gas case. Expressions are obtained for the structure factor and elementary excitations for the system at low but finite temperatures. Dissert. Abstr.

N77-13866 Pittsburgh Univ., Pa.
MICROWAVE ABSORPTION STUDY OF IMPURE SUPERCONDUCTING ALUMINUM IN A MAGNETIC FIELD Ph.D. Thesis
Kishor Anant Saralkar 1976 82 p
Avail: Univ. Microfilms Order No. 76-25945

Surface impedance of impure superconducting aluminum (nominal doping: 5 atomic percent silver) was studied using a calorimetric technique. Microwave absorption data were taken on two alloy samples with different microstructures. The single crystal sample showed sharp peaks in the absorption curves in a static magnetic field. The peak amplitude had a maximum as a function of magnetic field. The peaks were observed to be centered on the gap as modified by the magnetic field. Similar results were obtained for the polycrystalline sample. A semi-classical theory is presented to account for the absorption peak. The high absorption at the gap is obtained by using a modified coherence factor which includes the effect of short electron free path and a large static magnetic field. Dissert. Abstr.

N77-13867 California Univ., Berkeley.
ELECTRON PARAMAGNETIC RESONANCE OF IONS SUBSTITUTED INTO PARAMAGNETIC TRANSITION METAL ION HOSTS Ph.D. Thesis
Michael Robert St. John 1975 174 p
Avail: Univ. Microfilms Order No. 76-26242

The electron paramagnetic resonance (EPR) spectra of transition metal ions substituted as impurities into paramagnetic transition metal ion host lattices was studied. Criteria for determining when reasonably sharp spectra were expected are presented. The literature of observed impurity spectra in various hosts is reviewed. A number of unexplained line width effects such as broadening on lowering the temperature, anisotropy, and field dependences were observed. These effects were explained in terms of two processes, (1) host spin-lattice relaxation narrowing, and (2) spin quenching. Host spin-lattice relaxation narrowing produces sharp impurity lines when the host has a fast T1 and the impurity has a T1 slow enough not to broaden the lines. Dissert. Abstr.

N77-13868 Ohio State Univ., Columbus.
EFFECTS OF PRESSURE ON KINETICS OF CRYSTAL NUCLEATION IN LITHIUM DISILICATE GLASS Ph.D. Thesis
James Joseph Tuzzeo 1976 108 p
Avail: Univ. Microfilms Order No. 76-24701

This study was conducted to determine the effects of high pressure on the kinetics of crystal nucleation of lithium disilicate glass. The crystal morphology and growth behavior in this glass system at atmospheric conditions, as determined by optical and electron microscopy and X-ray diffraction methods, was similar to other observations of the same glass composition. Introduction times estimated from nucleation density versus time plots were in reasonable agreement with those determined experimentally and theoretically. By assuming the diffusion coefficient for atom transport across the nucleus-matrix interface to be equivalent to that for transport in the bulk liquid, and employing diffusion and thermodynamic data on this system, good agreement was obtained between rates determined by experiment and rates predicted by homogeneous steady state nucleation rate theory. Dissert. Abstr.

N77-13869 State Univ. of New York, Buffalo.
TRANSIENT RELAXATION OF EXCITED STATES IN A THERMIONIC DIODE Ph.D. Thesis
Tao Chang 1976 174 p
Avail: Univ. Microfilms Order No. 76-26506

The gray scale providing maximum ease of visual interpretation of black and white photoscans was determined empirically from studies conducted on a number of observers. In addition, using a signal generator in conjunction with a large aperture densitometer, count-rate versus film density curves were measured for five commercial photoscanners. None of these matched the ideal gray scale. All provided too little differentiation in the dark end of the scale. Following analysis of the data display systems of these scanners, one scanner was modified to provide a better gray scale. It was not possible to match the ideal gray scale curve exactly, but scans derived from the modified curve was found preferable by clinicians. Dissert. Abstr.

N77-13870 Tennessee Univ., Knoxville.
STRESS-INDUCED HEATING IN A Nb-Ti SUPERCONDUCTING COMPOSITE Ph.D. Thesis
Alireza Moazed 1976 128 p
Avail: Univ. Microfilms Order No. 76-24845

Different sources of mechanical heat generation were examined. In order to overcome the practical disadvantages of the solution to this nonlinear coupled thermoelasticity problem, a simple model was investigated. This model uses the hysteresis loop area, in the stress-strain curve of the superconductor, as the generated heat per unit volume of the material. To verify the model, in a series of tests the temperature change of a superconducting sample was measured under various loadings. The tests were carried out at room temperature and in liquid helium. An existing two-dimensional finite element program was modified to calculate the total heat generation in an axisymmetric solid, due to electromagnetic and external loads. The program calculates the stresses and uses the loop area data to arrive at the generated heat. Dissert. Abstr.

N77-13871 Illinois Univ., Urbana-Champaign.
LUMINESCENCE, ABSORPTION, AND PRESSURE STUDIES OF NITROGEN-DOPED AND NITROGEN-FREE GALLIUM ARSENIDE PHOSPHIDE AND INDIUM GALLIUM PHOSPHIDE Ph.D. Thesis
Ronald Jarl Nelson 1976 147 p
Avail: Univ. Microfilms Order No. 76-24149

Optical absorption data on N-free GaAs(1-y)Py and N-free In(1-x)GaxP are reported. These data are the first to show the free exciton absorption peak in a III-V ternary alloy. Using these absorption data, reliable values were obtained for the direct bandgap, the band edge bowing parameter, and the direct-indirect crossover in GaAs(1-y)Py (Y sub c approximately equal to 0.45, 77 K) and in In(1-x)GaxP (X sub c approximately equal to 0.72, 77 K). The luminescence and absorption behavior of the nitrogen isoelectronic trap in GaAs(1-y)Py was investigated as a function of composition and pressure. In addition, absorption, photoluminescence, and luminescence lifetimes of In(1-x)GaxP:N were examined. Implications of the results for light emitting devices are discussed. Dissert. Abstr.

N77-13872 Stanford Univ., Calif.
SUPERCONDUCTIVITY AND RANGE OF EXISTENCE OF THE A15 PHASE IN THE NIOBIUM-GERMANIUM SYSTEM Ph.D. Thesis
Awni Baker Hallak 1976 133 p
Avail: Univ. Microfilms Order No. 76-26008

Niobium-germanium films which remain superconducting up to 22.5 degrees Kelvin were prepared using high rate (33-132 Angstroms per second) electron-beam codeposition. The effect of gas impurities on the stability and structure of the A15 phase was investigated. The presence of oxygen in the deposition chamber during the film condensation was found to be necessary for stabilizing the A15 phase with a high superconducting transition temperature. Analysis of niobium-germanium films showed that oxygen can extend, to a certain limit, the germanium-rich range of the A15 phase with an accompanying decrease in the lattice constant. The effect of different oxygen partial pressure on the A15 phase boundary, the lattice constant, the superconducting transition temperature, width of the transition, and the electrical resistance ratio was also examined.
Dissert. Abstr.

N77-13873 Virginia Univ., Charlottesville.
HIGH-FIELD GALVANOMAGNETIC PROPERTIES OF IRON Ph.D. Thesis
William Hugo Lowrey 1976 157 p
Avail: Univ. Microfilms Order No. 76-25032

Magnetoresistance and Hall resistivity were measured in single crystals of iron in magnetic fields up to 220 kG, in the temperature range 1.1-4.2K. The single crystals were grown in the form of whiskers by the hydrogen reduction of iron(II) chloride, and had residual resistance ratios as high as 10,000. Dissert. Abstr.

N77-13874 Virginia Polytechnic Inst. and State Univ., Blacksburg.
SUPERCONDUCTIVITY AND LOW TEMPERATURE PROPERTIES OF NIOBIUM DISELENIDE SINGLE CRYSTALS GROWN BY DIRECT VAPOR TRANSPORT Ph.D. Thesis
Norris Earl Lewis 1976 93 p
Avail: Univ. Microfilms Order No. 76-24329

A procedure for the growth of high purity single crystals of 2H-NbSe2 by a direct vapor transport (DVT) method was developed. Single crystal growth rate and the degree of crystal perfection were studied as deviations from stoichiometry were made over the compositional range of Nb0.95Se2 to Nb1.05Se2. Single crystal perfection was also studied as changes were made in the reaction and annealing times. Residual resistivity ratio (RRR) values were observed over the range of 21 to 140 and superconductivity was observed over the range of 6.60 deg K to 7.12 deg K as growth conditions were varied. It was concluded that selenium acts as a transporting agent for the growth of the single crystals. X-ray photoelectron spectroscopy (XPS) measurements were made of the oxidation state of niobium on the surface and in the bulk of 2H-NbSe2 samples prepared by the DVT and iodine vapor transport (IVT) procedures. Measurements were also made of iodine incorporated in the lattice of the IVT samples. Dissert. Abstr.

N77-13875 California Univ., Los Angeles.
AN IMPROVED ANALYSIS OF THE TRANSIENT RESPONSE OF AN MOS-C Ph.D. Thesis
Takanori Takino 1976 157 p
Avail: Univ. Microfilms Order No. 76-25246

The transient response of an MOS-C was investigated. The transient response was found to be a useful technique to determine minority carrier lifetime and surface generation velocity by earlier workers. The effect of non-uniformity of impurity doping profile in the semiconductor on capacitance versus time (C-t) measurement was investigated and a correct method was presented to determine minority carrier lifetime and surface generation velocity. Those values determined by the conventional method contain errors if the MOS-C sample has a non-uniform impurity doping profile. Another technique to determine minority carrier lifetime and surface generation velocity by using transient measurement of charge Q(t) on the MOS-C sample was presented. A simple method which is applicable in a wide range of amplitude of a step voltage was described. Dissert. Abstr.

N77-13876+ Commissariat a l'Energie Atomique, Grenoble (France). Lab. d'Electronique.
THIN AMORPHOUS MAGNETIC FILMS FOR BUBBLE MEMORIES Final Report [COUCHES MINCES MAGNETIQUES AMORPHES POUR MEMOIRES A BULLES]
R. Meyer and H. Jouve Dec. 1974 30 p refs In FRENCH
(Contract DGRST-73-7-1736)
Avail: NTIS HC A03

The preparation of thin Gd-Co films for utilization in bubble memory devices was studied. Glass was used as substrate material. The condition for production of amorphous films by vacuum deposition was determined. Reproducible results were obtained by using an homogeneous target consisting of a molten alloy. The polarization voltage of the substrate allows adjusting the film's composition to the desired value. Two limits were met in producing cobalt-gadolinium films: the preparation of films with magnetization less than 500 Gauss was difficult as a result of the coercitive field, and the magnetization is very sensitive to temperature. ESA

N77-13877+ Centre National d'Etudes des Telecommunications, Lannion (France). Dept. Physique, Materiaux et Technologie.
SEMI-INSULATING GaAs LAYERS DOPED WITH OXYGEN BY HIGH ENERGY ION IMPLANTATION Final Report [ETUDE DES COUCHES SEMI-ISOLANTES D'AsGa DOPE A L'OXYGENE PAR IMPLANTATION IONIQUE A HAUTE ENERGIE]
P. N. Favennec and J. F. Palmier Jun. 1975 52 p refs In FRENCH; ENGLISH summary
(Contract DGRST-73-7-1349)
Avail: NTIS HC A04

The properties of semi-insulating GaAs layers obtained by oxygen implantation were investigated. Each oxygen ion removes two carriers independently of the nature of the major impurity and the concentration of the substrates. Conditions for obtaining the layers and their position were determined for energies ranging from 300 keV to 3.6 MeV. A good mobility is noted for the GaAs layer between the surface and the semi-insulating layer. Its thickness depends on the implantation parameter. A band structure diagram is proposed for the implanted layer and other properties are described based on transport properties and photovoltaic effects. ESA

N77-13878# AEG-Telefunken, Frankfurt am Main (West Germany).
NEW TECHNOLOGIES FOR SILICON HIGH POWER DEVICES. CONTROL OF THE CARRIER LIFETIME IN SILICON BY PLATINUM Final Report
Kurt Roy Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 59 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-32) Avail: NTIS HC A04/MF A01; ZLDI, Munich, DM 12,00

The influence of platinum on the carrier lifetime in silicon was investigated. Platinum has at least two deep energy levels in silicon, an acceptor niveau at EC - 0.25 eV and a donator niveau at EV + 0.33 eV. It decreases the minority carrier lifetime in p- and n-doped silicon in a similar way to gold. Its diffusibility is also very similar to that of gold. Therefore it should be possible to use it for decreasing tau in power devices. Compared with gold it has the advantage that the reverse characteristics are not so strongly impaired. It was found that for turn-off times between 20 and 30 microsec - desirable for frequency thyristors - the device receives so much platinum that the forward voltage drop strongly increases. Therefore the use of platinum for decreasing tau in power devices will be restricted to special applications. Author (ESA)

N77-13879# Siemens A.G., Munich (West Germany). Werk fuer Halbleiter.
FLOAT-ZONE GROWTH OF DISLOCATION-FREE PHOSPHORUS DOPED SILICON SINGLE CRYSTALS WITH CONTROLLED RADIAL RESISTIVITY PROFILES; SILICON FOR THYRISTORS TO BE FIRED BY EXCEEDING THE BREAKOVER VOLTAGE Final Report
Wolfgang Keller Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 73 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-33) Avail: NTIS HC A04/MF A01; ZLDI, Munich, DM 14,95

The influence of important growth parameters upon the shape of the solid/liquid interfaces of the melt of phosphorus-doped dislocation-free float-zone silicon single crystals and their radial dopant distribution is investigated. Qualitative preliminary models for the formation of the shape of the melt and the relationship to some parameters are presented. A suitable combination of the parameters in question enables the crystal grower to grow crystals with a homogeneous dopant distribution as well as crystals with a distribution applicable for thyristors to be fired by exceeding the breakover voltage. Results similar to those for 34 mm crystals were found for crystals of larger diameters.
Author (ESA)

N77-13880# AEG-Telefunken, Heilbronn (West Germany). Fachbereich Halbleiter.
PHYSICAL MEASUREMENT TECHNIQUES TO CHARACTERIZE SEMICONDUCTOR MATERIALS Final Report
Klaus Graff Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1976 96 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-76-34) Avail: NTIS HC A05/MF A01; ZLDI, Munich, DM 19,75

A selected number of measurement techniques was investigated to characterize the technologically most important semiconductor materials. A new calibration of the oxygen in silicon IR-absorption band was carried out at low temperatures. A new method, based on surface photo tension measurement, to determine the composition of ternary III-V-compounds and an improved technique for exact measurements of the carrier lifetime in silicon are reported. These and other methods such as X-ray topography and electron spin resonance were applied to investigate impurity reactions in silicon and their influence on device parameters. Author (ESA)

N77-13881# Stuttgart Univ. (West Germany). Kristallab.
CRYSTAL GROWTH OF III-V-SEMICONDUCTORS UNDER 0-g-CONDITIONS
Klaus-Werner Benz and Herbert Weiss (Erlangen-Nuremberg Univ.) Bonn Bundesmin. fuer Forsch. u. Technol. Apr. 1976 78 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRT-1074; GfW-RV-21-V-91/74)
(BMFW-FB-T-76-05) Avail: NTIS HC A05/MF A01; ZLDI, Munich, DM 16,00

The most important methods to grow crystals of group 3 and 5 semiconductors are discussed, with particular emphasis on zero gravity conditions. The influence of microgravity is different for various methods. The crucible-free floating zone technique will be a promising improvement in crystal growth of III-V-compounds from the melt (InSb, GaSb) and solution (InSb, GaSb, GaAs, GaP, InP). Proposals for crystal growth experiments in Spacelab are made. Author (ESA)

N77-13882# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
UPPER CRITICAL FIELD RATIO IN TYPE 2 SUPERCONDUCTORS: MICROWAVE DIFFERENTIAL MEASUREMENTS OF

H SUB c3 AND H SUB c2 IN VANADIUM NEAR T SUB c
M. Flamini, P. L. Indovina, S. Onori (Perugia Univ., Italy), A. Rogani, and P. Tonna 20 Dec. 1975 43 p refs In ITALIAN; ENGLISH summary
(ISS-P-75/20) Avail: NTIS HC A03/MF A01

A brief critical review on the experimental results and the existing theories of the upper critical field ratio H sub c3/H sub c2 in type 2 superconductors is presented. Experimental results in vanadium near the transition temperature are also presented. The study of modification of the surface and bulk properties for T leading to the critical temperature can clarify the two temperature problems. The consistence of the experimental data for H sub c3/H sub c2 with previous theoretical models is discussed. Author (ESA)

N77-13883# International Business Machines Corp., Hopewell Junction, N.Y. East Fishkill Lab.
DAMAGE PROFILES IN SILICON AND THEIR IMPACT ON DEVICE RELIABILITY, PART 2 Technical Report, 1 Jul. - 31 Dec. 1975
G. H. Schwuttke Mar. 1976 82 p refs
(Contract DAHC15-72-C-0274; ARPA Order 2196)
(AD-A024826; IBM-TR-22.1997-Pt-2; TR-7) Avail: NTIS HC A05/MF A01 CSCL 20/12

The report consists of two chapters. Chapter 1 discusses experimental and theoretical investigations of the growth kinetics of oxidation induced stacking faults. Theoretically, it is shown that growth of stacking faults can be described through condensation of silicon interstitials at the fault site during oxidation. Condensation of silicon interstitials is controlled through a tensile stress in the silicon surface generated during the formation of the SiO2 film on the silicon surface. Good agreement between experimental and calculated data for fault length and activation energy is obtained. Chapter 2 discusses the technique of Impact Sound Stressing (ISS). GRA

N77-13884# Litton Systems, Inc., Morris Plains, N.J. Lambda/Airtron Div.
RESEARCH ON CRYSTAL GROWTH OF OPTICAL AND LASER MATERIALS Final Report, 1 Jul. 1970 - 31 Dec. 1975
R. F. Belt, R. Dharmarajan, R. C. Puttbach, and R. Uhrin Jun. 1976 135 p refs
(Contract N00014-70-C-0379)
(AD-A025821) Avail: NTIS HC A07/MF A01 CSCL 20/2

The first part of this report describes attempts to grow single crystals of zircon (ZrSiO4) by flux and hydrothermal techniques. Crystals grown from a lithium tungstate melt were colored yellow brown in corners indicating absorption of a growth impurity along preferred crystallographic planes. The impurity is suspected to be iron reported in the lithium tungstate flux. Hydrothermal zircon growth was accomplished using a 3 molar aqueous KF mineralizer at about 30,000 psi and 500 C. The nutrient used was ZrO2 and SiO2 powders pressed at 30,000 psi and sintered at 1520 C. Due to the relatively low solubility of zircon in various molten salts, the hydrothermal method appears to be more suitable than the flux method for growing large single crystals of zircon. However, even at 600 C the hydrothermal growth rate is about 0.005 inch/day. The second part describes research efforts to prepare high purity rare earth fluorides, grow single crystals of Er, Ho, and Tm doped YLiF4, and test fabricated laser rods for operation at 2.06 micrometers. All fluorides were prepared by hydrofluorination of 99.99% commercial oxides at 800 - 1200 C in a platinum reactor. Single crystal growth was performed in a N2-HF atmosphere using a top seeded solution method. A platinum furnace was developed along with a diameter control device based on continuous crystal weighing. GRA

N77-13885# Illinois Univ., Urbana-Champaign. Coordinated Science Lab.
HIGH RESOLUTION LOW ENERGY ELECTRON DIFFRACTION FROM THE ALUMINUM (100) SURFACE
John Franklin Wendelken Oct. 1974 176 p refs
(Contract DAAB07-72-C-0259)
(AD-A025348; R-667; UILU-ENG-74-2233) Avail: NTIS HC A09/MF A01 CSCL 20/2

A new high resolution low energy electron diffractometer has been constructed. This apparatus has been applied in a program of surface studies dealing with the electronic, vibrational, geometrical, and chemical structure of the A1(100) surface. The surface-plasmon dispersion relation was examined to provide information important to the understanding of surface electronic properties. Measurements were made at T = 100 K and at T = 300 K. An apparent temperature dependence of the plasmon dispersion may be attributed primarily to the temperature dependence of the inelastic diffuse background. As a prerequisite to the application of a two-step model to the inelastic data, a survey of specular elastic scattering was conducted. These measurements are presented in absolute intensity units for the case T = 85 K. From these data it is possible to calculate the lattice spacing normal to the surface for the surface layer. The influence of lattice vibrational properties on electron scattering has been probed through an examination of the temperature dependence of both coherent and diffuse elastic scattering. The vibrational energy of oxygen adsorbed on the surface has been measured and the excitation probability as a function of scattering geometry has been observed. Author (GRA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N77-13886 California Univ., Los Angeles.
THERMODYNAMICS OF LIQUID MIXTURES IN THE REGION OF AN UPPER CRITICAL SOLUTION TEMPERATURE: METHANE-TETRAFLUOROMETHANE Ph.D. Thesis
Armand Arthur Fannin, Jr. 1976 188 p
Avail: Univ. Microfilms Order No. 76-25193

The thermodynamic behavior of the methane-tetrafluoromethane system is studied. An analysis of the data is performed using the power law functions that describe the system in terms of the limiting values of the critical exponents. The measurements are shown to be consistent with the phenomenological theory of static scaling. It is shown that the concentration variable volume fraction scaling law is a better order parameter than mole fraction. An analysis of gravity effects near the critical solution point is made. A criterion is formulated to predict the relative magnitude of gravity effects as a function of relative densities of the pure components and cell geometry. The coexistence curve is analyzed in the light of gravity effects to give a value of beta. The critical temperature and critical volume fraction are also determined. Dissert. Abstr.

N77-13887 Colorado Univ., Boulder.
SCATTERING BY LONG RANGE AND SCREENED POTENTIALS Ph.D. Thesis
Mark David Semon 1976 173 p
Avail: Univ. Microfilms Order No. 76-23680

Taylor's work which established the relation between the screened and pure Coulomb scattering probabilities, is extended to other long-range potentials and to potentials made up of a Coulomb potential plus a spherically symmetric short-range part. The connection between the screened and unscreened Coulomb cross sections is then considered. It is shown, in Born Approximation, that the cross section for a sharply cutoff Coulomb potential does not tend to the Rutherford cross section as the screening radius Rho goes toward infinity. On the other hand, for certain smooth screening functions, it is shown, again in Born Approximation, that the screened Coulomb cross section does tend to the Rutherford cross section as Rho goes toward infinity. Finally, in the case of short-range potentials, it is shown exactly, that the screened scattering probability and cross section both tend to the corresponding unscreened quantities as Rho goes toward infinity, whether the screening function is smooth or not. Dissert. Abstr.

N77-13888 Iowa Univ., Iowa City.
THERMODYNAMICS OF INTERNAL VARIABLES IN THE CONTEXT OF ABSOLUTE REACTION RATE THEORY AND THE NOTION OF INTRINSIC TIME Ph.D. Thesis
Suresh Awatrai Lalwani 1976 114 p
Avail: Univ. Microfilms Order No. 76-26302

The chief character of this equation is the exposition, for the first time, of the general nonlinear form of relationship between the internal forces and fluxes. A precise physical explanation of the internal variables is proposed. The internal variable represents the 'significant' response of a group of atoms whose motion is impeded by a potential energy barrier. As a consequence, the microforce encountered in Eyring's theory is identified as the potential gradient causing this response by the group of atoms. Furthermore, the precise relationship of this microforce with the externally applied force fields is established. The notion of intrinsic time introduced by Valanis and its use in the description of actual mechanical behavior of materials is discussed in the context of the nonlinear internal constitutive equation presented. As one application of the presented theory, the correlation of experimental creep and stress relaxation of copper at two different temperatures is achieved successfully. Dissert. Abstr.

N77-13889# Paris-Sud Univ., Orsay (France).
SPECTRAL AND SCATTERING THEORY OF THE SCHROEDINGER EQUATION FOR THREE-BODY SYSTEMS
J. Ginibre Oct. 1976 38 p refs Presented at the 50th Anniversary Symp. of the Schroedinger Equation, Vienna, 10-12 Jun. 1976
(LPTHE-76/9) Avail: NTIS HC A03/MF A01

The status of the spectral and scattering theory of the nonrelativistic quantum mechanical three body problem is reviewed. Special emphasis is given to the work of Faddeev and his followers. The Faddeev equations are used. Author

N77-13890 Rochester Univ., N.Y.
QUANTUM MECHANICS AS A GENERALIZED STOCHASTIC THEORY IN PHASE SPACE Ph.D. Thesis
Mandyam Doddamane Srinivas 1976 197 p
Avail: Univ. Microfilms Order no. 76-24025

A class of multi-time phase space distribution functions are presented such that an arbitrary quantum multi-time correlation function can be expressed as a phase space average of the form encountered in classical stochastic theories. The nonclassical features of these multi-time distribution functions are studied and it is shown that they may be considered as characterizing a generalized stochastic process in phase space. It is demonstrated that the multi-time distribution functions that correspond to Hamiltonian evolution of isolated quantum systems, satisfy a certain condition that may be regarded as characterizing a generalized Markov process. Also investigated are certain special features of the generalized stochastic processes that characterize the evolution of open systems. Finally, the relation between the formulation presented and some previous attempts to formulate quantum mechanics as a Markov process in phase space is discussed. Dissert. Abstr.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N77-13891*# National Aeronautics and Space Administration, Washington, D.C.
NASA'S UNIVERSITY PROGRAM: ACTIVE GRANTS AND RESEARCH CONTRACTS, FISCAL YEAR 1976
1976 335 p
(NASA-TM-X-74142) Avail: NTIS HC A15/MF A01 CSCL 05A

NASA Field Centers and certain Headquarters Program Offices provide funds for those research and development activities in universities which contribute to the mission needs of that particular NASA element. Although NASA has no predetermined amount of money to devote to university activities, the effort funded each year is substantial. This annual report is one means of documenting the NASA-university relationship, frequently denoted, collectively, as NASA's University Program. Author

N77-13892# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
EVALUATION OF COMMAND AND CONTROL INFORMATION SYSTEMS FROM THE USER'S POINT OF VIEW
Karlheinz Wagner and Guenter Gabisch Jul. 1976 57 p refs In GERMAN; ENGLISH summary
(FFM-241) Avail: NTIS HC A04/MF A01

A method of evaluation for military command and control system is presented; a user requirement profile was developed based on the decision making process. Requirements for the user and for the management information systems are discussed, and an evaluation using a task matrix is proposed. For individual titles, see N77-13893 through N77-13894.

N77-13893 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
EVALUATION OF MILITARY COMMAND AND CONTROL INFORMATION SYSTEMS
Karlheinz Wagner *In its* Evaluation of Command and Control Inform. Systems Jul. 1976 p 1-23 ref In GERMAN; ENGLISH summary (For primary document see N77-13892 04-81)

A method of evaluation for military command and control system is presented. Starting from the model of the decision process a general catalogue of criteria is defined. Rating these criteria by their importance one sets a requirement profile for a special system. Using this requirement profile and evaluation can be carried out. Author (ESA)

N77-13894 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
MIS AND ITS USER
Guenter Gabisch (Fernuniv. Hagen, West Ger.) *In its* Evaluation of Command and Control Inform. Systems Jul. 1976 p 24-52 refs In GERMAN; ENGLISH summary (For primary document see N77-13892 04-81)

The requirements for the user and for the MIS are discussed using bibliographical data. A method is presented based on partial objectives of the MIS and defining a task matrix. With this matrix the functional intensity of institutions and the institutional intensity of functions are shown. Author (ESA)

N77-13895# Texas A&M Univ., College Station. Inst. of Statistics.
A STATISTICAL PROCEDURE FOR OPTIMIZATION OF PERT (PROJECT EVALUATION AND REVIEW TECHNIQUE) NETWORK SCHEDULING SYSTEMS
R. K. Spoeri, L. J. Ringer, and R. L. Sielken, Jr. Apr. 1976 192 p refs
(Contract N00014-68-A-0140; NR Proj. 047-700)
(AD-A025022; THEMIS-TR-53) Avail: NTIS HC A09/MF A01 CSCL 05/1

This report is concerned with developing and documenting a system for the statistical analysis and optimization of Program Evaluation and Review Technique (PERT) network scheduling systems. Previous research and results are noted and documented. A technique to allow for network simplification based upon 'blocks' of activity configurations is discussed. Approximation of network completion time distribution and moments based on two points from each activity:s completion time distribution is studied, and extended to allow for unequal probability at each percentile. Also, a procedure for optimum allocation of time to project activities when network completion time is to be reduced or compressed is presented. Existing computer programs are modified, tested and documented. New codes have been prepared as required and combined with the others to facilitate implementa-

tion of the total program package. The integrated system incorporating all areas is explained, so as to provide for statistical and optimization analysis of PERT networks. GRA

N77-13896# Texas A&M Univ., College Station. Inst. of Statistics.
INCORPORATING PROJECT COST CONSIDERATIONS INTO STOCHASTIC PERT (PROJECT EVALUATION AND REVIEW TECHNIQUE)
Paul P. Beimer and Robert L. Sielken, Jr. Nov. 1975 65 p refs
(Contract N00014-68-A-0140; NR Proj. 047-700)
(AD-A025021; THEMIS-TR-52) Avail: NTIS HC A04/MF A01 CSCL 05/1

This report extends classical PERT to incorporate both random activity durations and project cost considerations. Project costs include both planned activity costs and penalties for activities exceeding their allowed durations. Several problem formulations are mentioned, and the determination of a minimum cost schedule satisfying a predetermined project deadline is discussed in detail. This latter problem is formulated as a separable programming problem which can be solved by the computer algorithm documented in the appendices. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N77-13897 National Lending Library for Science and Technology, Boston Spa (England).
AN ANALYSIS OF THE FOLLOW-UP SCANNING PERFORMED BY AN APPARATUS FOR READING DIGITAL INFORMATION FROM FILM
A. A. Gurevich and L. P. Derenchenko [1975] 23 p refs Transl. into ENGLISH from Leningrad, Glav. Geof. Obs., T. Vyp. 347 (USSR), 1975 p 136-145 in ENGLISH and RUSSIAN (NLL-M-24130-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Technical principles of read-out of information recorded linewise on films are described. The characteristic feature of the system is the occurrence of a nonlinear link between beam deflection from the line center and the signal strength at the photo-electric system. The apparatus for dense recording of the cross-sectional dimensions of the lines of the film employs consecutive reading of the information through a scanning beam controlled by a follow-up system which ensures sufficiently precise movement of the beam along the center of the line by means of a cathode-ray tube. To record information onto the line it is most common to use a binary code with pulse manipulation. The input scanning signal is the position of the information line, the output signal the position of the cathode-ray beam projection. Reading is performed using continuously extended film. The beam is moved in both directions so that the line is scanned on the direct reading pass and the next line on the return pass. A simplified block diagram of the follow-up system and algorithms are presented herewith. I.M.

N77-13898 National Lending Library for Science and Technology, Boston Spa (England).
A SYSTEM FOR TRANSCRIBING ARCHIVE METEOROLOGICAL INFORMATION FROM PUNCHED CARDS TO MICROFILM
A. N. Nogtikov and Ye. P. Ryzhikh [1975] 12 p Transl. into ENGLISH from Vses. Nauch.-Issled. Inst. Gidromet. Inf., Mirov. Tsent. Danny (Moscow), T. Vyp. 4, 1975 p 3-7
(NLL-M-24129-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Specifications for a computerized system to microfilming hydrometerological informations are presented. The process may be divided into five stages as follows: (1) preparation of raw data for transcription (on punch card); (2) recording of information on magnetic tape using Minsk 22 computer; (3) transcribing information from magnetic tape onto microfilm; (4) photochemical processing; and (5) control of reliability of the information on microfilm. A block diagram of the microfilming process and description of the method is also included. I.M.

N77-13899 New Mexico Univ., Albuquerque.
A METRIC GRAPH STRUCTURE FOR INFORMATION RETRIEVAL Ph.D. Thesis
Karl Jerry Melendez 1976 75 p
Avail: Univ. Microfilms Order No. 76-25671

Progressive graphs are studied and the search algorithms which use this graph structure are presented. The search algorithms always perform correctly on any progressive graph, but the presence of the progressive property in a graph is not sufficient to insure that the algorithms will work efficiently. The characteristics of a progressive graph which will optimize the search algorithms are discussed and algorithms to build and optimize progressive graphs are given. The results of a small problem show that the search process using the graph created by these algorithms can be very efficient. Finally, the distance function property which determines when a graph is a progressive graph is isolated and studied. Dissert. Abstr.

N77-13900*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
SYSTEMATICALLY DISSEMINATING TECHNOLOGICAL INFORMATION TO POTENTIAL USERS
James D. Russell [1976] 3 p Repr. from NPSI Journal, v. 15, no. 8, Oct. 1976 p 5-7
(Contracts NAS9-14016; NAS9-14970)
(NASA-CR-151124; LARS-IN-111076) Avail: NTIS HC A02/MF A01 CSCL 05B

Rapid technological information dissemination system related to the field of remote sensing is presented. The technology transfer staff systematically designed instructional materials and activities using the matrix as an organizer to meet the need of the students, scientists and users in a rapidly expanding technology. I.M.

N77-13901# Office of Telecommunications, Washington, D.C.
COMMUNITY INFORMATION AND SERVICES CENTERS (CISC'S): CONCEPTS FOR ACTIVATION
Cleve Hopkins Jul. 1976 128 p refs
(PB-256428/4; OTR-76-94) Avail: NTIS HC A07/MF A01 CSCL 05B

Telecommunications technology is described as are data bank contents, an operational plan, basic community service center functions, and integration of a CISC with the 911 emergency center. Comments are made on staff training, space requirements, CISC location, and estimated costs of the experiment. A bibliography is included. GRA

N77-13902# Capital Systems Group, Rockville, Md.
PAGE-CHARGE POLICIES AND PRACTICES IN SCIENTIFIC AND TECHNICAL PUBLISHING: A HISTORICAL SUMMARY AND ANNOTATED BIBLIOGRAPHY
Jul. 1976 63 p refs
(Contract NSF C-1001)
(PB-256409/4) Avail: NTIS HC A04/MF A01 CSCL 05B

This document was prepared as background material for a study on page charges viewed within the context of Federal support of scientific and technical publication. The purpose was to conduct a thorough review of Federal policy options through an examination of current page-charge practices. This volume includes a historical overview and an annotated bibliography. The bibliography is organized in chronological order to enable the reader to trace the development of opinion and official policy concerning page charges over the last 40 years. An author index is also included. GRA

N77-13903# National Library of Medicine, Bethesda, Md.
MEDICAL SUBJECT HEADINGS, TREE STRUCTURES, 1977
Aug. 1976 464 p Supersedes PB-243900
(PB-255933/4; NLM-MED-76-05; PB-243900) Avail: NTIS HC A20/MF A01 CSCL 05B

All Medical Subject Headings currently in use by the National Library of Medicine's indexers, catalogers, and searchers are

arranged in a hierarchical manner showing relationships between broader and narrower terms. Minor and geographic descriptors are included. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N77-13904# DARCOM Intern Training Center, Texarkana, Tex.
ANALYSIS OF THE EFFECTIVENESS OF THE PREPRODUCTION EVALUATION CONTRACT IN PREVENTING COST OVERRUNS Final Report
George N. Cone May 1976 47 p refs
(AD-A024818; DARCOM-ITC-02-08-76-220) Avail: NTIS HC A03/MF A01 CSCL 05/3

This research report examines the cost overrun figures for both PPE and conventional contracts. It compares the cost of the two types of contracts, and statistical methods are employed to measure the cost overrun differences between them. The shortcomings of conventional contracting methods are reviewed and the advantages and disadvantages of the PPE concept are discussed. The data revealed significant differences between the two types of contracts examined and recommendations are made as to when the more complex PPE concept is justified.
Author (GRA)

N77-13905# Planning and Conservation Foundation, Sacramento, Calif.
THE MARGINAL COST AND PRICING OF ELECTRICITY: AN APPLIED APPROACH
Charles J. Cicchetti, William J. Gillen, and Paul Smolensky Jun. 1976 410 p refs
(Grant NSF SIA-74-24370)
(PB-255967/2; NSF/RA-760183) Avail: NTIS HC A18/MF A01 CSCL 05C

A practical guide is provided for the analysis of the marginal cost structure of electric utilities for the purpose of designing electricity tariffs. The premise states that tariffs which reflect the principal variations in marginal costs are superior to those which do not. A generalized description of the approach to marginal cost, its determinants, sources of variation and calculation is given. There are three illustrative case studies in which this methodology is applied. A computer algorithm with a user's guide for the computation of marginal costs and related processes is provided. GRA

N77-13906# Urban Inst., Washington, D.C.
DISCUSSION OF RELEVANCE OF BEA AREAS TO THE ECONOMIC DEVELOPMENT ADMINISTRATION Final Report
Carl E. Snead 5 Feb. 1976 37 p
(Grant EDA-PF-495)
(PB-256676/8; EDA/OER-76/013) Avail: NTIS HC A03/MF A01 CSCL 05C

The Bureau of Economic Analysis (BEA) area framework is discussed along with ways in which it contributes to the analysis of subnational economic development. In particular the potential uses to EDA of the BEA area framework are described in either of two circumstances: (1) if BEA areas were to become eligible designated areas, or (2) if no change is made in present designation criteria for EDA programs. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N77-13907 Princeton Univ., N.J.
STATISTICAL ANALYSIS OF TRAFFIC SYSTEMS: A TIME SERIES APPROACH Ph.D. Thesis
Neil William Polhemus 1976 352 p
Avail: Univ. Microfilms Order No. 76-23871

A general approach for analyzing the dynamic behavior of traffic systems based on statistical methods of discrete time series analysis is presented. Considerable emphasis is placed on modeling fluctuations in traffic parameters during periods when the rate of flow is not constant. Both time domain and frequency domain techniques are considered, with extensive application to eight-hour samples of traffic through several air traffic control sectors. By abstracting the concept of space, a traversal process is formulated which can be adapted to any traffic situation, including simple stream flows. The dynamic behavior of the process is analyzed by constructing serially correlated measurements of some fundamental traffic parameter. The resulting time series is then analyzed as a discrete time process with continuous state space. Dissert. Abstr.

N77-13908 Virginia Polytechnic Inst. and State Univ., Blacksburg.
A COMPUTER-ASSISTED TECHNIQUE FOR PLANNING MINIMUM IMPACT TRANSMISSION RIGHT OF WAY ROUTES Ph.D. Thesis
Charles Willard Smart 1976 207 p
Avail: Univ. Microfilms Order No. 76-24342

A computer-assisted system was developed as an aid in the process of planning and evaluating the impact of electric transmission rights of way. The system was designed to facilitate the objective analysis of proposed construction activities and to provide insights into the location of routes which tend to minimize the overall adverse impacts incurred by society. The system includes a series of processes for acquiring regional information on economic, social and environmental site characteristics in a computer readable form. Procedures for the creation and maintenance of a computerized data base of this resource information were developed. Dissert. Abstr.

N77-13909*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
WATER MONITOR SYSTEM: PHASE 1 TEST REPORT
R. E. Taylor and E. L. Jeffers Oct. 1976 122 p
(NASA-TM-X-58179; JSC-11020) Avail: NTIS MF A01/HC A06 CSCL 06I

Automatic water monitor system was tested with the objectives of assuring high-quality effluent standards and accelerating the practice of reclamation and reuse of water. The NASA water monitor system is described. Various components of the system, including the necessary sensors, the sample collection system, and the data acquisition and display system, are discussed. The test facility and the analysis methods are described. Test results are reviewed, and recommendations for water monitor system design improvement are presented. Author

N77-13910*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 1: DATA PROCESSING AND TRANSFER PANEL Final Report
Aug. 1975 206 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73961) Avail: NTIS HC A10/MF A01 CSCL 05K

The data processing and transfer technology areas that need to be developed and that could benefit from space flight

experiments are identified. Factors considered include: user requirements, concepts in 'Outlook for Space', and cost reduction. Major program thrusts formulated are an increase in end-to-end information handling and a reduction in life cycle costs. J.M.S.

N77-13911*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 2: SENSING AND DATA ACQUISITIONS PANEL Final Report
Aug. 1975 287 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73962) Avail: NTIS HC A13/MF A01 CSCL 05K

Advanced technology requirements associated with sensing and data acquisition systems were assessed for future space missions. Sensing and data acquisition system payloads which would benefit from the use of the space shuttle in demonstrating technology readiness are identified. Topics covered include: atmospheric sensing payloads, earth resources sensing payloads, microwave systems sensing payloads, technology development/evaluation payloads, and astronomy/planetary payloads. J.M.S.

N77-13912*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 3: NAVIGATION, GUIDANCE AND CONTROL PANEL Final Report
Aug. 1975 231 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73963) Avail: NTIS HC A11/MF A01 CSCL 17G

User technology requirements are identified in relation to needed technology advancement for future space missions in the areas of navigation, guidance, and control. Emphasis is placed on: reduction of mission support cost by 50% through autonomous operation, a ten-fold increase in mission output through improved pointing and control, and a hundred-fold increase in human productivity in space through large-scale teleoperator applications. J.M.S.

N77-13913*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 4: POWER TECHNOLOGY PANEL Final Report
Aug. 1975 195 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73964) Avail: NTIS HC A09/MF A01 CSCL 21H

Technology requirements in the areas of energy sources and conversion, power processing, distribution, conversion, and transmission, and energy storage are identified for space shuttle payloads. It is concluded that the power system technology currently available is adequate to accomplish all missions in the 1973 Mission Model, but that further development is needed to support space opportunities of the future as identified by users. Space experiments are proposed in the following areas: power generation in space, advanced photovoltaic energy converters, solar and nuclear thermoelectric technology, nickel-cadmium batteries, flywheels (mechanical storage), satellite-to-ground transmission and reconversion systems, and regenerative fuel cells. J.M.S.

N77-13914*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 5: PROPULSION TECHNOLOGY PANEL, PART 1 Final Report
Aug. 1975 242 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73965) Avail: NTIS HC A11/MF A01 CSCL 21H

Payload experiments which could be carried out in near earth space using the shuttle orbiter, its payload bay, the Spacelab, and/or some free-flying device that might be used for long duration testing were identified. Specific areas examined in terms of user requirements include: chemical propulsion, nuclear propulsion (fission, fussion, radioisotopes), and collected energy (coherent energy and solar electromagnetic energy). Cost reduction objectives for advanced propulsion technology development were also developed. J.M.S.

N77-13915*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICAL AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 6: STRUCTURES AND DYNAMICS PANEL Final Report
Aug. 1975 93 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73966) Avail: NTIS HC A05/MF A01 CSCL 13M

Structural requirements for future space missions were defined in relation to technology needs and payloads. Specific areas examined include: large area space structures (antennas, solar array structures, and platforms); a long, slender structure or boom used to support large objects from the shuttle or hold two bodies apart in space; and advanced composite structures for cost effective weight reductions. Other topics discussed include: minimum gage concepts, high temperature components, load and response determination and control, and reliability and life prediction. J.M.S.

N77-13916*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICAL AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 7: MATERIALS PANEL Final Report
Aug. 1975 170 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73967) Avail: NTIS HC A08/MF A01 CSCL 11G

Materials technology requirements pertinent to structures, power, and propulsion for future space missions are identified along with candidate space flight experiments. Most requirements are mission driven, only four (all relating to space processing of materials) are considered to be opportunity driven. Exploitation of the space environment in performing basic research to improve the understanding of materials phenomena (such as solidification) and manufacturing and assembly in space to support missions such as solar energy stations which require the forming, erection, joining, and repair of structures in space are among the topics discussed. J.M.S.

N77-13917*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 8: THERMAL CONTROL PANEL Final Report
Aug. 1975 170 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73968) Avail: NTIS HC A08/MF A01 CSCL 20D

Technology deficiencies in the area of thermal control for future space missions are identified with emphasis on large space structures and cold controlled environments. Thermal control surfaces, heat pipes, and contamination are considered along with cryogenics, insulation, and design techniques. Major directions forecast for thermal control technology development and space experiments are: (1) extend the useful lifetime of cryogenic systems for space, (2) reduce temperature gradients, and (3) improve temperature stability. J.M.S.

N77-13918*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 9: ENTRY TECHNOLOGY PANEL Final Report
Aug. 1975 138 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73969) Avail: NTIS HC A07/MF A01 CSCL 22A

An advanced space transportation system heavy lift orbiter, hypersonic atmospheric entry missions, development of an emergency astronaut life boat, and basic research in boundary layer transition are among the topics discussed. Emphasis is placed on the need for space testing and for better mathematical models describing the flow fields around complex structures.
J.M.S.

N77-13919*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 10: BASIC RESEARCH PANEL Final Report
Aug. 1975 136 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73970) Avail: NTIS HC A07/MF A01 CSCL 05H

Possible research experiments using the space transportation system are identified based on user requirements. Opportunity driven research areas include quantum electronics, cryogenics system technology, superconducting devices and detectors, and photo-induced reactions. Mission driven research requirements were examined and ranked based on inputs from the user group.
J.M.S.

N77-13920*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 11: LIFE SUPPORT PANEL Final Report
Aug. 1975 44 p refs Conducted at Madison College, Harrisonburg, Va. 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73971) Avail: NTIS HC A03/MF A01 CSCL 06K

Life support technology requirements for long-term space habitation are identified with emphasis on regeneration capabilities and biological life support systems. Other topics discussed include: water recovery, oxygen recovery, waste management recycle, and a man-made closed ecology with selected biological species.
J.M.S.

N77-13921*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. EXECUTIVE SUMMARY
Aug. 1975 92 p Conducted at Madison College, Harrisonburg, Va., 3-16 Aug. 1975 Prepared jointly with Old Dominion Univ., Norfolk, Va. 11 Vol.
(Grant NsG-1186)
(NASA-TM-X-73960) Avail: NTIS HC A05/MF A01 CSCL 05B

Research and technology investigations are identified in eleven discipline technologies which require or which could significantly benefit from an in-space experiment, systems demonstrations, or component test using the Space Transportation System. Synopses of the eleven technology panels reports are presented.
J.M.S.

N77-13922# Department of Transportation, Washington, D.C. Office of R and D Plans and Resources.
ANALYSIS OF FISCAL YEAR 1977 DOT PROGRAM BY POLICY AND RD AND D MANAGEMENT OBJECTIVES. PROGRAM LEVELS FOR FISCAL YEARS 1975, 1976, 1977, VOLUME 1 Management Report, 1975 - 1977
Jun. 1976 218 p 2 Vol.
(PB-255401/2; DOT-TST-76-69.1) Avail: NTIS HC A10/MF A01 CSCL 13B

The analysis of the DOT budget requests for fiscal year 1977 is presented in terms of its relationship to DOT policy and RD and D objectives. These objectives are: (1) modernize regulation and legislation, (2) increase efficiency and service, (3) improve safety and security, (4) lessen unfavorable environmental impacts, (5) minimize adverse impacts on energy constraints, and (6) increase knowledge base. The total budget of $14.1 billion contains $367.7 million for RD and D or about 2.6 percent of the total.
GRA

N77-13923# Department of Transportation, Washington, D.C. Office of R and D Plans and Resources.
ANALYSIS OF FISCAL YEAR 1977 DOT PROGRAM BY POLICY AND RD AND D MANAGEMENT OBJECTIVES. PROGRAM LEVELS FOR FISCAL YEARS 1975, 1976, 1977, VOLUME 2 Management Report, 1975 - 1977
Jun. 1976 553 p 2 Vol.
(PB-255402/0; DOT-TST-76-69.2) Avail: NTIS HC A24/MF A01 CSCL 13B
For abstract, see N77-13922.

N77-13924# Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
MUNICIPAL WASTES AS A FERTILIZER SOURCE
James R. Gilley 1976 14 p refs Presented at 1976 Sprinkler Irrigation Assoc. Tech. Conf., Kansas City, Mo., 24 Feb. 1976
(Contract DI-14-34-0006-6028; OWRT Proj. A-041-NEB(1))
(PB-256206/4; paper-5042; W76-11117) Avail: NTIS HC A02/MF A01 CSCL 02C

Municipal sewage wastes, sludges and effluents can be used on land for crop production with benefits for both agricultural and urban interests, but the waste and the land must be carefully managed to achieve favorable results. Successful land utilization of municipal wastes for crop production requires the usual basic soils, climate and crop information. Many waste application systems maximize waste application to the land while preventing environmental contamination and in addition produce an acceptable crop yield. Accomplishing this often requires considerable adjustments from the usual crop and management practices.
GRA

N77-13925# Booz-Allen and Hamilton, Inc., Washington, D.C.
RELATIONSHIP OF ENVIRONMENTAL IMPROVEMENT EFFORTS ON DEVELOPMENT IN ECONOMICALLY DISTRESSED AREAS
May 1976 40 p
(Grant EDA-PF-503)
(PB-256702/2; EDA/OER-76/011) Avail: NTIS HC A03/MF A01 CSCL 05C

The impact that environmental pollution controls might have on patterns of area development is discussed with particular emphasis on economically distressed areas. This problem statement represents a synthesis of three concerns or observations: (1) efforts to comply with environmental protection standards will increase the capital and operating costs of industry which may result in plant closings, unemployment and disruptive effects on community life; (2) differential enforcement of environmental standards across geographic areas may influence the movement and location of industry between cities, and redefine the balance between urban and rural centers; and (3) programs and policies designed specifically to spur economic activity in distressed areas may be impacted by counter directional environmental control efforts.
GRA

N77-13926# Gellman Research Associates, Inc., Jenkintown, Pa.
THE ROLE AND APPLICATION OF SCIENTIFIC AND TECHNICAL INFORMATION IN THE PROCESS OF INOVATION: INVENTION AND CONCEPTION Final Report
Aaron Gellman Dec. 1975 619 p
(Grant NSF GN-42272)
(PB-256580/2) Avail: NTIS HC A99/MF A01 CSCL 05B

The information gathering and use habits of a sample of scientists and engineers who, by job function and performance,

were found to be innovators were explored. The data were collected for the study using a structured interview format with a number of open ended questions. The survey was administered in person by a member of the project staff. Formal channels of communications, particularly the STI subset, are not extensively employed by the innovators. GRA

88 SPACE SCIENCES (GENERAL)

N77-13927# Royal Greenwich Observatory, Herstmonceux (England). Time and Latitude Service.
GREENWICH TIME REPORT, OCTOBER - DECEMBER 1975
Dec. 1975 17 p
Avail: NTIS HC A02/MF A01

Observations were made between April and June 1975 with the Herstmonceux photographic zenith tube. The Greenwich atomic time scale was determined from the unweighted mean of three or more cesium clocks with rate corrections. ESA

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N77-13928 Texas Univ., Austin.
DEFINITION OF THE LOW MASS RRs STARS THROUGH PHOTOELECTRIC RADIAL VELOCITIES AND HIGH TIME RESOLUTION uvby PHOTOMETRY Ph.D. Thesis
Gordon Wayne VanCitters, Jr. 1976 176 p
Avail: Univ. Microfilms Order No. 76-26720

A rapid scanning radial velocity spectrometer of the griffin type was designed and constructed specifically for obtaining high time resolution velocity curves for the RRs stars. Evidence for rapid variations in the line strengths for Al Vel, V703 Sco, and RS Gru was given particular attention. Power spectra of the light curves for V703 Sco and SX Phe show no periodic components or increased power at up to 4 minute periods which would match the observed line strength variations. The light curves of both doubly and singly period variables are smooth. Photometry in the uvby system was obtained for CY Aqr and DY Peg, and the variations of the physical parameters determined over the light cycle through model atmosphere calibrations of the color indices. Data obtained for CY Aqr, DY Peg, Al Vel, V703 Sco, and RS Gru result in a clear mass separation of the Pop II RRs (Al Vel) stars from the Pop I RRs (Delta Sct) stars. Dissert. Abstr.

N77-13929 Wisconsin Univ., Madison.
OAO-2 OBSERVATIONS OF M31 AND M33 Ph.D. Thesis
John Edward Davis 1976 122 p
Avail: Univ. Microfilms Order No. 76-18874

The nearby spiral galaxies M32 and M33 have been observed with the orbiting astronomical observatory, using six broadband filters in the range lambda lambda 1550 to 4250; a ten arc minute (diameter) aperture was employed for the observations. The luminosity distributions at lambda 2460 in both galaxies correlate well with the distributions of resolved stars; M31, in particular, displays peaks in luminosity near the positions of Baade's arms S4 and N4 and the neutral hydrogen peaks. The ultraviolet colors of various regions in M31 correlate well with ground based colors obtained at Kitt Peak National Observatory. An integrated color for M31, 2460 to 4250, is roughly an average of the colors of the bulge and bluest spiral arms. The color gradient in M33 is small; the color 1910 to 2460 is constant over the galaxy. Dissert. Abstr.

N77-13930 Stanford Univ., Calif.
ANALYSIS OF DUAL-FREQUENCY OBSERVATIONS OF INTERPLANETARY SCINTILLATIONS TAKEN BY THE PIONEER 9 SPACECRAFT Ph.D. Thesis
Horen Chang 1976 231 p
Avail: Univ. Microfilms Order No. 76-25982

Interplanetary scintillation data are reported. These data were acquired by sending 50 and 423 MHz signals from Stanford to the sun-orbiting Pioneer 9 spacecraft and then telemetering results back to the earth. The integrated electron contents along the propagation path were also simultaneously measured. The closest distance of the propagation path to the sun ranged from 0.1 to 1 A.U. Ground transmitter served as a constant-magnitude, monochromatic, point source of observation. As a result, data are free from some inherent ambiguities contained in the majority of the previous data. Experimental apparatus and procedures of data reduction are described in considerable detail. Dissert. Abstr.

N77-13931 Princeton Univ., N.J.
TELEVISION PHOTOMETRY OF GALAXIES IN CLUSTERS Ph.D. Thesis
Alan Wayne Hoffman 1976 214 p
Avail: Univ. Microfilms Order No. 76-23824

An SEC television system was used to obtain optical image data of galaxies in the central regions of six clusters whose redshifts range from 0.05 to 0.20. Typical exposure times were 20 minutes at f/13.5 with wide-band red filters. A method of computer analysis was developed to measure metric and isophotal magnitudes. Approximately 2,900 galaxy images were analyzed with a limiting photometric accuracy of 0.1 magnitudes for a single measurement. Isophotal measurements were taken down to 23 mag/sq. arc sec isophotes, and metric measurements were taken out to 20.3 kpc diameters (H = 50 km/sec Mpc). The relation between mean isophotal surface brightness and isophotal magnitude was considered for each of the six clusters for which galaxy data were obtained. Isophotal and metric magnitudes were compared. Composite luminosity distribution were formed by combining distributions of the six clusters.

N77-13932 Pennsylvania State Univ., University Park.
NUMERICAL CALIBRATION OF STELLAR MODELS Ph.D. Thesis
David L. Hall 1976 189 p ref
Avail: Univ. Microfilms Order No. 76-24768

Analytic solutions have been developed for upper main sequence stars with electron scattering opacity. The effects of radiation pressure were included throughout the configuration. The stellar models consist of Taylor series expansions generated by computer assisted algebraic manipulation and fitted together by Newton iteration. Numerical models, computed by Haselgrove-Hoyle iterations, were compared to the analytic models and found to agree within 4 parts in 100,000 in all the eigenvalues including those at the radiative-convective interface. The analytic models provide a numerical calibration so that the accuracy of methods used in stellar structure computations can be determined. Dissert. Abstr.

N77-13933 Oklahoma Univ., Norman.
STATISTICAL AND SPECTROPHOTOMETRIC IDENTIFICATION OF BINARIES IN STAR CLUSTERS Ph.D. Thesis
Clifford Lee Bettis 1976 95 p
Avail: Univ. Microfilms Order No. 76-24358

The incidence of duplicity and distribution of secondary masses in open clusters were investigated using statistical techniques on UBVRI photometry. Important results were: (1) identification of stars likely to be binaries in the Hyades, Praesepe, and the Pleiades, (2) the scatter about the main sequences of single stars for these clusters was compatible with that of a one dimensional sequence within the limits of observational error, (3) the total scatter about the single-star main sequences for the Hyades and the Pleiades was analyzed and found to be incompatible with the secondary mass distribution function Abt and Levy found for field stars, and (4) unresolved binaries in open clusters can produce an error in distance of about 5 percent. Dissert. Abstr.

N77-13934 Ohio State Univ., Columbus.
THE CHARACTERISTICS OF THE RED SPECTRA OF THE LATE-TYPE SUPERGIANTS Ph.D. Thesis
Catherine Louise Imhoff 1976 103 p
Avail: Univ. Microfilms Order No. 76-24620

The red spectra of several late-type supergiants were studied using moderately high dispersion coude spectrograms. Special attention was given to delineating the spectral characteristics of the most luminous supergiants of luminosity class Ia and brighter. Two luminosity effects were studied in detail. First, the width of the photospheric lines increases with luminosity. The rate of increase is about 6 km/sec per luminosity class. The effect is independent of temperature. A coude dispersion, the change in stellar line widths, is large enough to allow one to assign the luminosity class of the star on the basis of visual inspection of the spectrograms. Second, the appearance of H alpha changes systematically with luminosity. The absorption line becomes broader and blueshifted from the H alpha rest velocity as one looks at more luminous supergiants. Dissert. Abstr.

N77-13935*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FINE STRUCTURE IN 3C 120 AND 3C 84 Ph.D. Thesis - Maryland Univ., 24 Aug. 1976
Laura Katherine Hutton Dec. 1976 104 p refs
(NASA-TM-X-71239; X-693-76-268) Avail: NTIS HC A06/MF A01 CSCL 03A

Seven epochs of very long baseline radio interferometric observations of the Seyfert galaxies 3C 120 and 3C 84, at 3.8-cm wave length using stations at Westford, Massachusetts, Goldstone, California, Green Bank, West Virginia, and Onsala, Sweden, have been analyzed for source structure. An algorithm for reconstructing the brightness distribution of a spatially confined source from fringe amplitude and so called closure phase data has been developed and successfully applied to artificially generated test data and to data on the above mentioned sources. Over the two year time period of observation, 3C 120 was observed to consist of a double source showing apparent super relativistic expansion and separation velocities. The total flux changes comprising one outburst can be attributed to one of these components. 3C 84 showed much slower changes, evidently involving flux density changes in individual stationary components rather than relative motion. Author

N77-13936# Academy of Sciences (USSR), Moscow. Space Research Inst.
SPECTRAL AND POLARIMETRIC INSTRUMENTATION FOR THE AIRCRAFT ASTROPHYSICAL INVESTIGATIONS IN THE RANGE 50-500mkm
G. B. Sholomitski, V. A. Soglasnova, I. A. Maslov, V. D. Gromov, M. Z. Khokholov, and V. V. Artamonov 1976 24 p refs Presented at the 19th COSPAR Symp. on Galactic and Extragalactic Infrared and Submillimeter Astron., Philadelphia, Jun. 1976 (D-228) Avail: NTIS HC A02/MF A01

The receiving equipment for aircraft astrophysical investigations in the far infrared was developed and flown in 1974/1975 onboard the AN-30 aircraft. Four types of infrared and submillimeter detectors, mainly of the photoresistor type, were used in the wavelength region from 10 mkm to 1 mm. Thermal background at the detectors was limited by cooled bandpass filters and by optimal matching of the detectors with the telescope optics. The spectral filters used were combinations of quasiresonance metal mesh filters of different structure and Q-factor from 2 to 7 with the Yamada cut-off powder filters. A tunable Fabri-Pero interferometer, a polarimeter for linear polarization measurements, and an aircraft 25 cm-telescope are described. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N77-13937 Ohio State Univ., Columbus.
THE CATALYTIC PRODUCTION OF INTERSTELLAR MOLECULAR HYDROGEN Ph.D. Thesis
Ronald George Tabak 1976 148 p
Avail: Univ. Microfilms Order No. 76-24696

Numerical calculations were made for a pure hydrogen dust cloud, and the abundances of H, H2, e, H(+), H(-), H2(+), H3(+) and occupied surface sites were determined for a large number of cases on the basis of a steady state distribution. Twenty-three chemical reactions were included, of which 19 were gas phase reactions, one involved the physical adsorption of H atoms onto the surfaces of cold dielectric grains and their subsequent desorption as molecules, and four actually involved catalysis. The latter process was assumed to occur on the surfaces of transition metal (iron) grains, which are less than 10 percent as abundant as dielectric grains. Catalysis was found to be an effective method of forming H2 from H in interstellar clouds, which is contrary to previous expectations. One of the reasons for this efficiency is the relatively high ambient temperature of small iron grains. Dissert. Abstr.

N77-13938 Princeton Univ., N.J.
THE NUMERICAL EVOLUTION OF THE COLLISION OF TWO BLACK HOLES Ph.D. Thesis
Kenneth Robert Eppley 1975 263 p
Avail: Univ. Microfilms Order No. 76-22596

The methods used to evolve numerically the initial data corresponding to two black holes at rest are described. The evolution is found to be unstable. Methods to improve the stability of two black hole evolution are discussed. A method of solving the Hamiltonian constraint numerically by a conformal mapping is described. A shift vector to minimize coordinate shear is applied to the maximal slicing of one black hole. Geodesic, initially maximal, and maximal slicings are given for the two black holes. With the maximal slicing, the initial data for two black holes separated by 4M is evolved until they merge to form a single black hole, as indicated by the behavior of the lapse function. The behavior of the Bel-Robinson gravitational Poynting vector suggests that some gravitational radiation is generated by the merging of the horizons. However, it is emitted so close to the hole that much of it may not be able to escape to infinity. Dissert. Abstr.

N77-13939 Washington Univ., Seattle.
ELECTRODYNAMICS OF NEUTRON STARS Ph.D. Thesis
William James Roberts 1976 180 p
Avail: Univ. Microfilms Order No. 76-25448

The problems attacked in this work relate primarily to vacuum electromagnetic fields and to the internal classical electrodynamics of neutron stars. Magnetospheres are dealt with only briefly. A number of new electrodynamic properties of neutron stars were found that suggest new approaches to the very difficult pulsar problem. The geometry of the field lines of a rotating magnetic dipole was considered. These results were useful for reconstructing the geometry of the emission region of pulsars, once the mechanism of radiation and basic dynamics of the emitting plasma was understood. If the high frequency pulses of the Crab Pulsar are produced by charges streaming along the magnetic field lines, the polarization behavior reflects a local property of the ensemble of radiating particles. Dissert. Abstr.

N77-13940+ Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse du C.N.R.S., Orsay (France). Lab. Rene Bernas.
EFFECTS OF SPACE ENVIRONMENT ON THE LUNAR REGOLITH Final Report [ETUDE DES EFFETS DU MILIEU SPATIAL SUR LE REGOLITHE LUNAIRE]
Michel Maurette and Yves Langevin 10 Dec. 1975 22 p refs In FRENCH; ENGLISH summary
(Contract DGRST-75-7-0115)
Avail: NTIS HC A02

The effects of the interplanetary medium on lunar dust grains were studied using a computer program for determining the complex movement of these grains in the lunar regolith due to meteoritic impact. This program was adapted to calculate several effects depending on the grains' depth in the regolith, resulting from their exposure to the solar wind and solar cosmic rays. The program was compared to an existing similar program in the U.S., resulting in an improvement of both. In particular, spallation effects in the lunar soil by galactic cosmic rays are now accounted for. Also, new methods have been proposed to obtain a better use of solar wind and solar cosmic ray effects in lunar dust grains. ESA

N77-13941# Academy of Sciences (USSR), Moscow. Space Research Inst.
LABORATORY EXPERIMENTS (PLASMA INTRUSION INTO THE MAGNETIC FIELD)

I. M. Podgorny 1976 25 p refs Presented at the AGU Intern. Symp. on Solar Terrest. Phys., Boulder, Colo., 7-18 Jun. 1976
(D-225) Avail: NTIS HC A02/MF A01

Investigations on laboratory simulation of space phenomena are reported. The collisionless, supersonic, and superalfvenic flow of the plasma was used as an artificial solar wind. The magnetosphere was formed as a result of its interaction with the magnetic dipole field that possesses the specific peculiarities of the earth's magnetosphere. The experimental results associated with the problems of the plasma penetration into the magnetosphere are dealt with. These results were obtained by means of both the systematic measurements of the plasma and magnetic field parameters and the active influence on the processes occurring in the magnetosphere. Experimental data demonstrating the important role of the magnetic field frozen in the solar wind in forming a boundary of the ionosphere of nonmagnetic bodies are also reported. Author (ESA)

N77-13942# Academy of Sciences (USSR), Moscow. Space Research Inst.
DISK ACCRETION ONTO A BLACK HOLE AT SUBCRITICAL LUMINOSITY
G. S. Bisnovatyi-Kogan and S. I. Blinnikov 1976 52 p refs
(PR-271) Avail: NTIS HC A04/MF A01

The influence of radiation pressure on the structure of accretion disk is considered when the total luminosity L approaches the Eddington limit L sub c. The motion of particles in the disk radiation field and gravitational field of a nonrotating black hole was investigated. It is shown that the disk accretion is destroyed when L approximately equals (0.6 + 1.0) sub c. Matter outflow from the central parts of the disk to infinity then sets in. It is concluded that the luminosity cannot significantly exceed the Eddington limit. It is shown that for L greater than or approximately equal to 0.1 L sub c the plasma in upper layers of the central region of the disk is heated up to temperatures approximately 10 to the 9th power K, and the disk becomes thicker as compared with the standard theory. The radiative force can generate magnetic fields B approximately 100 Gs. Convection is the main energy transfer mechanism along Z-coordinate in the central parts of the disk. The convection generates an acoustic flux which dissipates in the upper, optically thin layers of the disk and heats them. The comptonization of soft photons going from lower layers to the hot upper layers and variable accretion rate may explain the spectrum and variations of X-ray emission of the C.g X-1. Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N77-13943 California Inst. of Tech., Pasadena.
DEPTH-SENSITIVE ANALYSIS OF FLUORINE ON LUNAR SAMPLE SURFACES AND IN CARBONACEOUS CHONDRITES BY A NUCLEAR RESONANT REACTION TECHNIQUE Ph.D. Thesis
Richard Henry Goldberg 1976 132 p
Avail: Univ. Microfilms Order No. 76-24489

The nuclear resonant reaction 19 alpha gamma F(p,alpha)16 O was used to perform depth-sensitive analyses of fluorine in lunar samples and carbonaceous chondrites. The resonance at 0.83 MeV (center-of-mass) in this reaction is utilized to study fluorine surface films, with particular interest paid to the outer micron of Apollo 15 green glass, Apollo 17 orange glass, and lunar vesicular basalts. These results are distinguished from terrestrial contamination, and are discussed in terms of a volcanic origin for the samples of interest. Measurements of fluorine in carbonaceous chondrites are used to better define the solar system fluorine abundance. A technique for measurement of carbon on solid surfaces with applications to direct quantitative analysis of implanted solar wind carbon in lunar samples is described. Dissert. Abstr.

N77-13944 Arkansas Univ., Fayetteville.
RARE GAS ISOTOPIC ABUNDANCES IN METEORITIC AND TERRESTRIAL SAMPLES Ph.D. Thesis
Ralph Dee Sherrill 1976 139 p
Avail: Univ. Microfilms Order No. 76-26419

Rare gas isotopic compositions were mass spectrometrically determined on the gases released during temperature release experiments on the carbonaceous chondrite Murchison, the mineral thucholite, and the four granite samples Carney Lake, Red Rock, Wausau, and Westerly. The variations in the isotopic composition of rare gases released at various extraction temperatures from meteorites were explained as due to the fact that there exist reservoirs of two isotopically distinct gases with mixtures of these gases being released at different temperatures. The major difference in the isotopic composition of solar and planetary gas was attributed to a mass dependent fractionation process. Dissert. Abstr.

N77-13945 Princeton Univ., N.J.
INHOMOGENEOUS MODELS OF THE STRUCTURE OF THE JOVIAN ATMOSPHERE Ph.D. Thesis
William David Cochran 1976 101 p
Avail: Univ. Microfilms Order No. 76-23844

An analysis of the structure of the Jovian atmosphere, primarily based on the center to limb variations (CTLV) of the hydrogen quadrupole 4-0 S(1) line, is presented. These data require that the atmosphere have both reflecting and scattering properties. Two alternative cloud structures were developed. The first is a two cloud model consisting of a thin upper NH3 cloud and a lower NH4SH cloud, with absorbing gas between the clouds and above the upper cloud. The second model is a reflecting scattering model, in which a gas layer lies above a haze consisting of scattering particles and absorbing gas. The cloud scattering phase function in both models must be strongly forward throwing. The CTLV data require, however, the presence of a backscattering lobe on the phase function, with the backscattering intensity about 4% of the forward scattering. Dissert. Abstr.

N77-13946*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONCERNING A PHYSICO-CHEMICAL MODEL OF THE COMETARY NUCLEUS
A. H. Delsemme Washington Jul. 1976 47 p refs Transl. into ENGLISH from Memoires, Societe Royale des Sciences de Liege (Belgium), v. 12, no. 1, 1966 p 77-110
(NASA-TT-F-16767) Avail: NTIS HC A03/MF A01 CSCL 03B

To link models of the cometary nucleus with the phenomena of the development of the coma, surface physico-chemical phenomena which liberate gases are analyzed quantitatively. The entropy and enthalpy variations of their changes of state are treated with an equation expressing the gross energy balance. The major requirement of this equation is that it be easily computable numerically for nearly any model. The equation takes into account the variations of the latent heats with temperature. This equation is then applied to models obtained by assuming the simplest possible hypothesis on a constitution of the nucleus which takes cosmic data into account. Starting from cosmic abundances, it is shown via which mechanism free methane is lost from nucleus. The major remaining constituents are hydrates of methane and ammonia (85 percent) around meteoric fragments (15 percent). Author

N77-13947*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH SPECTRAL RESOLUTION GROUND-BASED OBSERVATIONS OF VENUS IN THE 450-1250 cm SUP-1 REGION
V. G. Kunde, R. A. Hanel, and L. W. Herath Nov. 1976 47 p refs
(NASA-TM-X-71234; X-622-76-249) Avail: NTIS HC A03/MF A01 CSCL 03B

The thermal emission of Venus was recorded during the winter of 1970-1971, and in 1973 using the 2.7m telescope at

McDonald Observatory. The double beam Michelson interferometer installed at the Coude focus was used. The spectrum was recorded between 400/cm and 1,400/cm. For the 1970 observations, the spectral resolution was 0.25/cm and the linear spatial resolution was 3/4 of the disk of Venus. In 1973 the spectral resolution was 0.20/cm with a spatial resolution 1/3 of the planetary disk. In addition to Venus, the moon, the sky adjacent to each object, and the zenith sky were recorded to help eliminate the absorption and emission effects of the earth's atmosphere. Author

N77-13948# Academy of Sciences (USSR), Moscow. Space Research Inst.
VENERA-9 AND VENERA-10: IR-SPECTROPHOTOMETRY OF CLOUD LAYER ON BOARD THE ORBITERS AND DESCENDERS
V. I. Gnedykh, V. I. Moroz, N. A. Parfentev, N. F. Sanko, and E. A. Ustinov 1976 10 p refs
(D-235) Avail: NTIS HC A02/MF A01

Measurements of scattered solar radiation inside the Venus cloud layer at altitudes between 64 and 34 km above the planetary surface were carried out by means of narrow-band photometers (three bands of about 0.8 mkm) installed onboard the Venera-9 and Venera-10 descenders. A series of the measurements of the intensity of solar radiation reflected from the cloud layer at wave lengths from 1.6 to 2.8 mkm were made using IR-spectrophotometers installed onboard the orbiters. The H2O content (0.001 at altitudes from 34 to 40 km) was estimated based on the analysis of the measurements taken from the descenders. The Venus cloud layer model, in adequate agreement with both these types of the observations, is characterized by the following main features: conservative scattering and optical thickness of about 25 in the 0.5 to 1.8 mkm wavelength range, average volume coefficient of scattering of about 0.00001/cm. Author (ESA)

N77-13949# Academy of Sciences (USSR), Moscow. Space Research Inst.
MECHANISMS OF ELECTRON RADIAL DIFFUSION AND SYNCHROTRON RADIATION IN JUPITER'S RADIATION BELTS
O. F. Prilutskii 1976 10 p refs
(D-237) Avail: NTIS HC A02/MF A01

The effect of magnetospheric electric fields on the brightness of Jupiter synchrotron radiation was analyzed. The possibility of remote sensing of radiation belts in the studies of Jovian magnetospheric electric fields, radial diffusion of relativistic electrons, and dynamics of Jupiter's ionosphere was examined. It is shown that observations of the variations of the spatial distribution of Jovian dm radiation allow the investigation of the relation between Jupiter radiation belt dynamic processes and the solar activity. The characteristic time of solar wind disturbance propagation from the earth to Jupiter amounts to several weeks allowing a series of observations after near the earth recording of solar wind variations. ESA

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N77-13950*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EFFECTS OF STREAM-ASSOCIATED FLUCTUATIONS UPON THE RADIAL VARIATION OF AVERAGE SOLAR-WIND PARAMETERS
Bruce E. Goldstein and J. R. Jokipii (Ariz. Univ., Tucson) [1976] 52 p refs
(Contract NAS7-100; Grant NsG-7101)
(NASA-CR-149316) Avail: NTIS HC A04/MF A01 CSCL 03B

The effects of nonlinear fluctuations due to solar wind streams upon radial gradients of average solar wind parameters are computed, using a numerical MHD model for both spherically symmetric time dependent and corotating equatorial flow approximations. Significant effects of correlations are found between fluctuations upon the gradients of azimuthal magnetic fields, radial velocity, density and azimuthal velocity. Between 400 to 900 solar radii stream interactions have transferred the major portion of the angular momentum flux to the magnetic field: at even greater distances the plasma again carries the bulk of the angular momentum flux. The average azimuthal component of the magnetic field may decrease as much as 10% faster than the Archimedean spiral out to 6 AU due to stream interactions, but this result is dependent upon inner boundary conditions. Author

N77-13951# European Space Agency, Paris (France).
OUT OF ECLIPTIC AND SOLAR STEREOSCOPY MISSION. REPORT ON THE PHASE A STUDY
25 May 1976 111 p refs
(ESA-DP/PS(76)-12) Avail: NTIS HC A06/MF A01

A baseline mission is proposed during which two spacecraft will be injected by the shuttle/four-stage interim upper stage combination into an interplanetary orbit towards Jupiter. Shortly after launch they will separate and travel near the ecliptic plane to Jupiter, after which they will go out of the ecliptic plane and pass, respectively, over the solar North and South Poles. The scientific payloads are partly identical (for magnetic fields, plasma charged particles, and X-rays) and partly individual, in particular coronagraphs and XUV heliographs. ESA

N77-13952# Academy of Sciences (USSR), Moscow. Space Research Inst.
COHERENT PROPAGATION OF NON-RELATIVISTIC SOLAR ELECTRONS
V. G. Kurt, Y. I. Logashev, and N. F. Pissarenko 1976 46 p refs
(PR-266) Avail: NTIS HC A03/MF A01

An experimental study of propagation of solar electrons with energy greater than 30 keV was carried out. Measurements were made from 1972 to 1974 using the Prognoz satellite borne instruments. Two-components structure of electron fluxes was found. Fast components, rather well observed after solar flares of minor importance, represent a compact beam of electrons propagating without scattering inside a narrow cone with opening less than or equal to 10 deg along the interplanetary magnetic field lines. Characteristics of this component are given. Peculiarities of slow or diffusive component of electron fluxes were compared with diffusive component of solar protons. It is shown that the diffusion coefficient for nonrelativistic electrons is offered which takes into account the presence of fast and slow components and their interaction with solar wind plasma oscillations. Author (ESA)

N77-13953 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
BOW SHOCK ASSOCIATED PROTON HEATING IN THE UPSTREAM SOLAR WIND
Rolf-Dieter Auer Heiner Gruenwaldt, and Helmut Rosenbauer Oct. 1975 65 p refs Revised Submitted for publication
(Contract BMFT-WRK-210)
(MPI-PAE/EXTRATERR-118) HC Avail: Issuing Activity

The proton component of the solar wind upstream of the earth's bow shock was investigated. A statistical study of the HEOS 2 satellite data measured from February 1972 to August 1974 was made. Employing T (parallel) B2/n2 as an indicator, the geometry and extent of the upstream proton heating zone and its relation to the bow shock was investigated. The heating process was found to be more effective near the bow shock than further away. When restricting the analysis to data within 10 earth radii from the bow shock an increase of 47% in T (parallel) B2/n2, of 10% in T (parallel), and a decrease of 13% in proton density number for shock perturbed conditions compared to unperturbed conditions were found. ESA

N77-13954# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 381, PART 1 (PROMPT REPORTS). DATA FOR APRIL-MARCH 1976. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 378 (SUPPLEMENT) FEBRUARY 1976
Hope I. Leighton May 1976 131 p
(PB-247137-381-1; SGD-381-Pt-1; NOAA-76062938-Pt-1) Avail: NTIS MF A01; HC available from National Climatic Center,

Attn: Publications, Federal Bldg., Asheville, N. C. 28801. Subscription $34.00/year includes Part 1 (Prompt Reports) and Part 2 (Comprehensive Reports); $18.00/year for either part. Annual Supplement containing explanation is included. $1.50/copy for either part; $1.40 for the extra issue CSCL 03B

Charts and imageries of solar activity recorded for the months of March and April of 1976 are reported. April's data includes: daily solar activity centers; sudden ionospheric disturbances; solar radio waves; cosmic rays; geomagnetic indices; and radio propagation indices. GRA

N77-13955# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.

SOLAR-GEOPHYSICAL DATA NUMBER 381, PART 2 (COMPREHENSIVE REPORTS). DATA FOR NOVEMBER-OCTOBER 1975 AND MISCELLANEA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 378 (SUPPLEMENT) FEBRUARY 1976

Hope I. Leighton May 1976 52 p refs

(PB-247137-381-2; SGD-381-Pt-2; NOAA-76062939-Pt-2) Avail: NTIS MF A01; HC available from National Climatic Center, Attn: Publications, Federal Bldg., Asheville, N. C. 28801. Subscription $34.00/year includes Part 1 (Prompt Reports) and Part 2 (Comprehensive Reports); $18.00/year for either part. Annual Supplement containing explanation is included. $1.50/copy for either part; $1.40 for the extra issue CSCL 03B

Included in this report are data for the months of October and November. The data recorded include: solar flares; solar radio waves; energetic solar particles and plasma; and magnetograms of geomagnetic storms. GRA

N77-13956# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.

SOLAR-GEOPHYSICAL DATA NUMBER 380, PART 1 (PROMPT REPORTS). DATA FOR MARCH-FEBRUARY 1976. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 378 (SUPPLEMENT) FEBRUARY 1976

Hope I. Leighton Apr. 1976 126 p

(PB-247137-380-1; SGD-380-Pt-1; NOAA-76051112-Pt-1) Avail: NTIS MF A01; HC available from National Climatic Center, Attn: Publications, Federal Bldg., Asheville, N. C. 28801. Subscription $34.00/year includes Part 1 (Prompt Reports) and Part 2 (Comprehensive Reports); $18.00/year for either part. Annual supplement containing explanation is included. $1.50/copy for either part; $1.40 for the extra issue CSCL 03B

Imageries that measure solar brightness are reported. The D2-B satellite launched from French Guyana on September 27, 1975, has been collecting spectroheliograms in the wavelength range 170-1,300A since October 15, 1975. Spectroheliograms at the wavelength of the 284 A FeXV line are received on a daily basis. GRA

N77-13957# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.

SOLAR-GEOPHYSICAL DATA NUMBER 380, PART 2 (COMPREHENSIVE REPORTS). DATA FOR OCTOBER-SEPTEMBER 1975 AND MISCELLANEA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 378 (SUPPLEMENT) FEBRUARY 1976

Hope I. Leighton Apr. 1976 34 p refs

(PB-247137-380-2; SGD-380-Pt-2; NOAA-76051113-Pt-2) Avail: NTIS MF A01; HC available from National Climatic Center, Attn: Publications, Federal Bldg., Asheville, N. C. 28801. Subscription $34.00/year includes Part 1 (Prompt Reports) and Part 2 (Comprehensive Reports); $18.00/year for either part. Annual Supplement containing explanation is included. $1.50/copy for either part; $1.40 for the extra issue CSCL 03B

Data that gives measurements of solar activity for the months October and September 1975 are reported. These data reports are based on the D2-B satellite results which was launched from French Guyana and which has been collecting spectroheliograms. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N77-13958*# Cornell Univ., Ithaca, N.Y.

ASTRONOMICAL POLARIZATION STUDIES AT RADIO AND INFRARED WAVELENGTHS. PART 1: GRAVITATIONAL DEFLECTION OF POLARIZED RADIATION

Brian K. Dennison Aug. 1976 81 p refs

(Grant NGR-33-010-146)

(NASA-CR-149215; CRSR-646-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 03B

The gravitational field is probed in a search for polarization dependence in the light bending. This involves searching for a splitting of a source image into orthogonal polarizations as the radiation passes through the solar gravitational field. This search was carried out using the techniques of very long and intermediate baseline interferometry, and by seeking a relative phase delay in orthogonal polarizations of microwaves passing through the solar gravitational field. In this last technique a change in the total polarization of the Helios 1 carrier wave was sought as the spacecraft passed behind the sun. No polarization splitting was detected. Author

N77-13959*# Cornell Univ., Ithaca, N.Y.

ASTRONOMICAL POLARIZATION STUDIES AT RADIO AND INFRARED WAVELENGTHS. PART 2: FAR INFRARED POLARIZATION OF DUST CLOUDS

Brian K. Dennison 1976 51 p refs

(Grant NGR-33-010-146)

(NASA-CR-149216; CRSR-647-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 03B

Far infrared polarization of dust clouds is examined. The recently observed 10 micron polarization of the Orion Nebula and the Galactic Center suggests that far infrared polarization may be found in these objects. Estimates are made of the degree of far infrared polarization that may exist in the Orion Nebula. An attempt to observe far infrared polarization from the Orion Nebula was carried out. Author

N77-13960*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

RECURRENT X-RAY OUTBURSTS FROM AQUILA X-1

L. J. Kaluzienski (Maryland Univ.), S. S. Holt, E. A. Boldt, and P. J. Serlemitsos Dec. 1976 12 p refs Submitted for publication

(NASA-TM-X-71236; X-661-76-260) Avail: NTIS HC A02/MF A01 CSCL 03B

Aquila X-1 observations by the All Sky Monitor on Ariel 5 are presented. Data is compared with that obtained by rocket survey, and by the Uhuru, OSO 7, and OAO 3 satellites. The variability of brightness is discussed as a connection between dwarf novae and long term transient X-ray sources. A.H.

N77-13961# Academy of Sciences (USSR), Moscow. Space Research Inst.

PRELIMINARY RESULTS OF THE X-RAY RADIATION RESEARCHING BY THE TELESCOPE FILIN ON BOARD THE SALYUT-4 SPACE STATION

V. Y. Berezhnoy, G. M. Grechko, A. A. Gubarev, E. F. Kirillov, P. I. Klimuk, V. G. Kurt, V. I. Sevastyanov, L. G. Titarchuk, E. I. Moskalenko (Sternberg Astron. Inst.), and E. K. Sheffer (Sternberg Astron. Inst.) 1976 25 p refs

(D-224) Avail: NTIS HC A02/MF A01

The instrumentation of the Filin X-ray telescope installed onboard the Salyut-4 space station for measuring X-ray emission of extraterrestrial sources in the 0.2 to 10 keV range is described. The instrumentation consists of four X-ray detectors, two star sensors, a solar sensor, a moon sensor, a measuring unit, a power supply unit, and a gas flow system. Preliminary results of some galactic X-ray source observations, namely the Sco X-1, Her X-1, Cir X-1, Cyg X-1, and A0620-00 (source detected by

the Ariel-5 satellite on August 3, 1975), are reported and discussed. ESA

99 GENERAL

N77-13962# European Space Agency, Paris (France).
LA RECHERCHE AEROSPATIALE. BI-MONTHLY BULLETIN NO. 1976-1
Nov. 1976 104 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1976-1, Jan.-Feb. p 1-61 Original French report available from ONERA, Paris FF 30
(ESA-TT-351) Avail: NTIS HC A06/MF A01

The following topics are discussed: interaction of a turbulent boundary layer and an oblique shock, effect of free stream turbulence on a turbulent boundary layer subjected to a position pressure gradient, turbulent diffusion mechanism in a turbulent mixing layer related to turbine blade cooling, thermochemical deposition on titanium alloy TA6V, CO2 laser amplification by an electron beam controlled discharge, test bed design for investigating long term performance of electrostatic thrusters, and investigation of low-cycle fatigue failure of a titanium alloy using scanning electron microscopy. For individual titles, see N77-13963 through N77-13969.

N77-13963 European Space Agency, Paris (France).
THICKENING AND SEPARATION OF A TURBULENT BOUNDARY LAYER INTERACTING WITH AN OBLIQUE SHOCK **c34**
Jean Cousteix, Robert Houdeville et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 1-19 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 1-11 Original report in FRENCH previously announced as A76-28751 (For primary document see N77-13962 04-99)

An experimental study of the three-dimensional interaction between a shock wave and a turbulent boundary layer is presented. The shock wave, generated by a wedge, is normal to the wall along which the boundary layer develops but oblique relative to the general direction of the flow. The Mach number is about 2.3. The boundary layer study is carried out for various angular settings of the wedge up to a shock intensity close to that causing separation. A method for calculating the boundary layer behavior which makes use of static pressure distributions measured on the wall is presented and compared to experimental results. Author (ESA)

N77-13964 European Space Agency, Paris (France).
BOUNDARY-LAYER DEVELOPING WITH POSITIVE PRESSURE GRADIENT IN A TURBULENT EXTERNAL FIELD **c34**
Daniel Arnal, Jean Cousteix, Roger Michel et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 20-42 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 13-26 Original report in FRENCH previously announced as A76-28752 (For primary document see N77-13962 04-99)

The influence of a free stream turbulence on a turbulent boundary layer which is subjected to a positive pressure gradient was studied. A high level of turbulence is generated by a grid of rods. Boundary layer measurements of the mean velocity and of the fluctuations are presented. The longitudinal velocity fluctuation is characterized by its mean quadratic value and by its spectrum. The influence of the free stream turbulence seems to be restricted to the external region of the boundary layer. The most important effects are obtained when the boundary layer is near separation. Calculations of the boundary layer by means of a set of transport equations are compared with the experiments. An integral method in which an adapted mixing length scheme is used is also proposed. Both calculation methods give a good level of agreement. Author (ESA)

N77-13965 European Space Agency, Paris (France).
MASS OR ENERGY DIFFUSION MECHANISMS IN TURBULENT MIXING LAYERS **c34**
Pierre-Jacques Michard, Michel Izard et al *In its* La rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 43-59 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 27-35 Original report in FRENCH previously announced as A76-28753 (For primary document see N77-13962 04-99)

Two series of experiments dealing wih the turbulent diffusion mechanism are presented: the first one consists of determining the temperature of a thin plate subjected on one of its faces to the convection flux of an external flow and cooling on part of its other face; the second concerns the study of the mixing of a jet emitted at the wall with an external flow. Both are related to studies concerning turbine blade cooling. The quantitative analysis of the results was performed through a computing diffusion phenomenon from a mixing length scheme; a simplified study of the mechanisms leads to an analytical expression of the behavior of parameters such as surface temperature or concentration along the wall. Author (ESA)

N77-13966 European Space Agency, Paris (France).
THERMOCHEMICAL DEPOSITS ON TITANIUM ALLOYS **c26**
Pierre Lepetit, Andre Hivert et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1971-1 (ESA-TT-351) Nov. 1976 p 60-73 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 37-44 Original report in FRENCH previously announced as A76-28754 (For primary document see N77-13962 04-99)

A method is described which has been used to produce coatings on the titanium alloy TA6V by thermochemical deposition. The halide (of copper, nickel, chromium, or silver) is finely pulverized and suspended in a solution of cyclohexanone and methyl methacrylate. This is painted on the surface of the titanium alloy, which is previously treated with an organic solvent to eliminate grease. The alloy is heated to a maximum temperature of 800 C in a furnace under vacuum. The thermochemical treatment improves the wettability of the surface by conventional brazings and increases its affinity for electrolytic or chemical deposition. The friction resistance of the alloy TA6V has been significantly improved using a Ag-Cu eutectic brazing with a melting point of 784 C and a brazing time of 17 hours.
Author (ESA)

N77-13967 European Space Agency, Paris (France).
CO2 LASER AMPLIFICATION IN AN ELECTRON-BEAM CONTROLLED DISCHARGE **c36**
Jean Bonnet *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 74-90 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 45-53 Original report in FRENCH previously announced as A76-28755 (For primary document see N77-13962 04-99)

A model for the calculation of the laser amplification in high pressure (CO2:N2:He) mixtures excited by an electrical discharge is described. A laser amplifier was also constructed in order to compare calculations and measurements of the small-signal gain. The validity of the model is demonstrated by that comparison for different mixtures and excitation conditions. Thus it is possible to use it for the simulation of a power amplifier. Author (ESA)

N77-13968 European Space Agency, Paris (France).
EQUIPPING THE B 61 SPACE SIMULATION FOR ELECTROSTATIC THRUSTER TESTS **c14**
Jean Labbe, Roger Benoist et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 91-96 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 55-57 Original report in FRENCH previously announced as A76-28756 (For primary document see N77-13962 04-99)

A test bed was designed to investigate the long-term performance of electrostatic thrusters and was successfully qualified using thrusters based on contact ionization of cesium. A mobile pumping unit, consisting of an ion pump and a high charge titanium sublimator and cooled by liquid hydrogen, produces a vacuum of .000051 Pa and a residual gas composition which has no significant perturbing effect on the performance

of the electrostatic thruster. Particles ejected from the thrusters are intercepted by an aluminum-copper honeycomb target. A mathematical model was used to determine the flux of metallic particles displaced from the target and retrodiffused towards the walls of the test chamber or the thruster for three groups of incident ions: those passing through the honeycomb; those striking the internal walls of the honeycomb; and those frontally striking the edge of the honeycomb. Results are presented for different types of thrusters. Author (ESA)

N77-13969 European Space Agency, Paris (France).
FIRST RESULTS OF THE MICROFRACTOGRAPHIC EXAMINATION OF FAILURE OF A TITANIUM ALLOY AT 450 C UNDER LOW CYCLE FATIGUE CONDITIONS c26
Georges Vidal, Guy Caruchet, Jean-Louis Bernard et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-1 (ESA-TT-351) Nov. 1976 p 97-100 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-1, Jan.-Feb. 1976 p 59-61 Original report in FRENCH previously announced as A76-28757 (For primary document see N77-13962 04-99)

Scanning electron microscopy was used to investigate low-cycle fatigue failure of a titanium alloy. The fatigue testing was carried out at 450 C in a furnace with a controlled atmosphere of pure argon to prevent the deterioration of the specimen surface by oxidation. The microfractographic results showed highly variable structures with no clear delineation between characteristics of the fatigue and final ruptures. Author (ESA)

N77-13970# European Space Agency, Paris (France).
LA RECHERCHE AEROSPATIALE. BI-MONTHLY BULLETIN NO. 1976-2
Nov. 1976 145 p refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. p 63-126 Original French report available from ONERA, Paris FF 30
(ESA-TT-352) Avail: NTIS HC A07/MF A01

The following topics are discussed: pilot behavior discrete time modelization using an electrooculometer and a simulated lunar module cockpit, visualization experiments conducted in a hydraulic test tunnel on the low velocity flow past simple airfoils employing various high-lift devices, low-cycle fatigue and microfractography of three aluminum alloys, and a Bragg diffraction bench for nondestructive testing of thin metallic parts by ultrasonic transparency visualization. For individual titles, see N77-13971 through N77-13974.

N77-13971 European Space Agency, Paris (France).
DISCRETE TIME MODELLING OF HUMAN PILOT BEHAVIOUR c54
Dominique Soulatges, Daniel Cavalli et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-2 (ESA-TT-352) Nov. 1976 p 1-25 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. 1976 P 63-73 Presented at the 11th Ann. Conf. on manual Control, Moffett Field, Calif., 21-23 May 1975 (For primary document see N77-13970 04-99)

Pilot behavior was observed using an electrooculometer and a simulated lunar module cockpit, and the behavior was modelled assuming that only one task can be performed at a time and that the pilot's operating mode depends on the flight subphase considered. Two strategies were applied to the numerical analysis: a Markovian strategy and a heuristic strategy. Results may be useful in the design of an automated piloting system.
Author (ESA)

N77-13972 European Space Agency, Paris (France).
STUDY BY HYDRODYNAMIC VISUALISATIONS OF VARIOUS PROCESSES FOR CONTROLLING SEPARATED FLOWS c34
Henri Werle, Marc Gallon et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-2 (ESA-TT-352) Nov. 1976 p 26-68 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. 1976 p 75-94 Original report in FRENCH previously announced as A76-33745 (For primary document see N77-13970 04-99)

Qualitative results, including a large number of photographs of visualized flows, are presented of some experiments conducted in a hydraulic test tunnel on the low-velocity flow past some simple airfoils employing various high-lift devices. The tests investigated means of avoiding or eliminating flow separation, procedures employing jet flaps for elongating the models, and schemes for organizing turbulent separations in order to generate extra lift. Some of the schemes studied included control of the boundary layer on a deflected flap by rotating the hinge, control by tangential blowing on the deflected flap (for a conventional airfoil and for a delta wing), flow past wings with lift past a semicircular wing and past a slender body with profiled nose lift-augmented by jet flaps, and flow past various types of vortex generators attached to the wall or leading edge of the various profiles. Author (ESA)

N77-13973 European Space Agency, Paris (France).
LOW CYCLE FATIGUE AND MICROFRACTOGRAPHY OF FATIGUE RUPTURES OF THREE ALUMINIUM ALLOYS c26
Georges Vidal, Guy Ramusat et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-2 (ESA-TT-352) Nov. 1976 p 69-98 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. 1976 p 95-107 Original report in FRENCH previously announced as A76-33746 (For primary document see N77-13970 04-99)

A total of 208 low-cycle fatigue tests in undulating tension and tension-compression was performed on smoothed and notched specimens of AG5, AU4G, and AU2GN aluminum alloys. The results are scattered very little. The S-N curves are continuous, except in undulating tension on smoothed specimens. For a low number of cycles to rupture, the S-N curve for notched specimens is higher than that for smooth specimens, especially in the case of undulating tension. Microfractography by scanning electron microscope often reveals several fatigue rupture initiations.
Author (ESA)

N77-13974 European Space Agency, Paris (France).
DEVICE FOR ULTRASONIC TRANSPARENCY VISUALIZATION OF THIN PARTS BY BRAGG DIFFRACTION c74
Bernard Baerd, Michel Billard, Jean-Claude Guinot, Roger Jean et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1976-2 (ESA-TT-352) Nov. 1976 p 99-141 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1976-2, Mar.-Apr. 1976 p 109-126 Original report in FRENCH previously announced as A76-33747 (For primary document see N77-13970 04-99)

A Bragg diffraction bench, using the selective properties of acoustic-optical interaction between a cylindrical coherent optical radiation and an ultrasonic field, was assembled. This instrument is intended for nondestructive testing of thin metallic parts by transparency visualization. Improvement of the ultrasonic assembly was studied with the aim of increasing sensitivity and penetration power through the appropriate choice of various ultrasonic media (in particular, reduction of acoustic impedance discontinuities). Experimental observations concerning resolving power are in agreement with the first results of an original theoretical calculation, still in the development stage. A few results concerning biomedical applications are presented.
Author (ESA)

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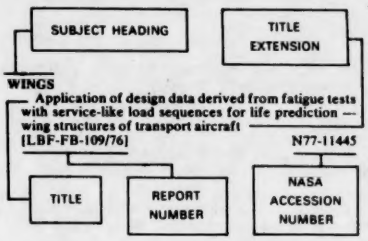

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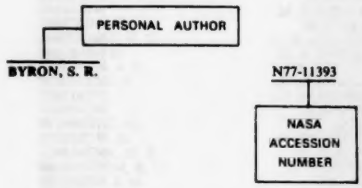

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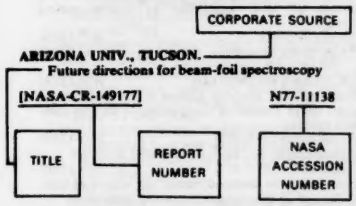

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Airport activity statistics of certificated route air carriers, 30 June 1974 - 30 June 1975
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Inventory of energy research and development [1973 - 1975], volume 3
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Inventory of energy research and development [1973 - 1975], volume 4
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Characterization and evaluation of wastewater sources United States Steel Corporation, Clairton Works, Pittsburgh, Pennsylvania, 28-31 January 1976
[PB-255586/0] N77-13566
Characterization and evaluation of wastewater sources United States Steel Corporation, Irvin Plant, Pittsburgh, Pennsylvania, 18-28 August 1975
[PB-255588/6] N77-13567
Characterization and evaluation of wastewater sources United States Steel Corporation, Edgar Thomson Plant, Pittsburgh, Pennsylvania, 22 July - August 1975
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ELF communications Seafarer program, site survey, western regions. Book 1: Summary
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ELF communications Seafarer program, site survey, western regions. Book 4: Antenna construction cost factors and installation plan
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ELF communications Seafarer program, site survey, western regions. Book 5: Earth conductivity data
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ELF communications Seafarer program, site survey, western regions. Book 4: Antenna construction cost factors and installation plan
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HOUSTON UNIV., TEX.
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High resolution low energy electron diffraction from the aluminum [100] surface
[AD-A025348] N77-13885

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON [ENGLAND].
The design of wide-angle diffusers
[IC-AERO-76-03] N77-13373

INDIANA UNIV., BLOOMINGTON.
Nonparametric statistics used in communication, meteorology, and reliability
[AD-A025195] N77-13763

INDUSTRIAL ENVIRONMENTAL RESEARCH LAB., RESEARCH TRIANGLE PARK, N. C.
Proceedings of the Stationary Source Combustion Symposium. Volume 1. Fundamental research
[PB-256320/3] N77-13569
Proceedings of the Stationary Source Combustion Symposium. Volume 2. Fuels and process research and development
[PB-256321/1] N77-13570

INFORMATION SYSTEMS, MENLO PARK, CALIF.
Antenna modeling program engineering manual
[AD-A025890] N77-13343

INSTITUT D'AERONOMIE SPATIALE DE BELGIQUE, BRUSSELS.
Scientific responsible awareness of atmospheric environment
[AERONOMICA-ACTA-A-159-1976] N77-13562

INSTITUT D'OPTIQUE THEORIQUE ET APPLIQUEE, PARIS [FRANCE].
Image forming by direct gammagraphy on photographic emulsions by coding optical processing of scintigraphy images
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INSTITUT FRANCO-ALLEMAND DE RECHERCHES, ST. LOUIS [FRANCE].
Holographic testing of rocket combustion chambers
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Shaped charge physics. Experimental results and recent theory
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Radio frequency electromagnetic radiation effects of detonating chemical explosive charges
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Possibilities of producing supersonic jets with shock tubes
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Research and development of an equipment for cineradiography
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Reliability of a new velocity measurement method for gases: The laser velocimetry
[ISL-R-132/75] N77-13402
Parametric investigation of a CO2 laser with a nonautonomous discharge preionized by an electron beam
[ISL-34/74] N77-13409
Computation of ballistic trajectories: Arc calculation and interpolation methods
[ISL-R-122/75] N77-13785
Production and recording of spark and detonation bangs for investigation of their effect on the hearing of Guinea pigs
[ISL-R-121/75] N77-13793

INSTITUT FUER INFORMATIONSVERARBEITUNG IN TECHNIK UND BIOLOGIE, KARLSRUHE [WEST GERMANY].
Quantitative study on preprocessing techniques for the recognition of handprinted characters
[BMVG-FBWT-75-27] N77-13714
The IITB pattern recognition concept. Theory and application to handwritten numbers, printed- and special characters
[BMVG-FBWT-76-4] N77-13715

INSTITUTE FOR DEFENSE ANALYSES, ARLINGTON, VA.
Infrared continuum absorption by atmospheric water vapor in the 8.12-micrometer window
[AD-A025377] N77-13597

INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Burner design criteria for control of NOx from natural gas combustion. Volume 2: Raw data and experimental results
[PB-256806/1] N77-13549

INSTITUTO GEOGRAFICO Y CATASTRAL, MADRID [SPAIN].
Spaceborne observation of Spain with remote sensor
[ISBN-84-500-6676-X] N77-13510

INSTITUTO NACIONAL DE TECNICA AEROESPACIAL, ESTEBAN TERRADAS, TORREJON DE ARDOZ [SPAIN].
Intasat satellite project: Information on one year's flight
[INTA-D-3126] N77-13106

INSTITUTO NACIONAL DE TECNICA AEROESPACIAL, MADRID [SPAIN].
Intasat program: Radio beacon data analysis
[INTA-I-800-6-75] N77-13107

INSTITUUT TNO VOOR BOUWMAYCRIALEN EN BOUWCONSTRUCTIES, DELFT [NETHERLANDS].
Investigation on the static behaviour of welded lattice girder joints in structural hollow sections
[IR-6-75-11] N77-13463
The wind load on chimneys in some countries
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Wind tunnel investigation
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Crack-width calculations for concrete offshore structures
[BI-75-95] N77-13466

INTERNATIONAL BUSINESS MACHINES CORP., HOPEWELL JUNCTION, N.Y.
Damage profiles in silicon and their impact on device reliability, part 2
[AD-A024826] N77-13883

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS, ROME [ITALY].
Report of the Eighth Session of the Tropical Experiment Board
[GARP-SPEC-REPT-20] N77-13615

IOWA UNIV., IOWA CITY.
Optimal design of mechanical systems with intermittent motion
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Mechanical design optimization for transient dynamic response
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A nonlinear form of the endochronic theory and its application to dynamic plasticity
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Thermodynamics of internal variables in the context of absolute reaction rate theory and the notion of intrinsic time
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ISTITUTO SUPERIORE DI SANITA, ROME [ITALY].
Multipole polarizabilities and shielding factors of hydrogen atcm with hydrodynamic analogy to quantum mechanics
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Lowest order and hypernetted chain calculations of nuclear matter
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Upper critical field ratio in type 2 superconductors: Microwave differential measurements of H sub c3 and H sub c2 in vanadium near T sub c
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J

JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA.
High temperature oxidation resistant cermet compositions
[NASA-CASE-NPO-13666-1] N77-13217
Frequency discriminator and phase detector circuit
[NASA-CASE-NPO-11515-1] N77-13315
Floating substrate process: Large area silicon sheet task low-cost silicon solar array project
[NASA-CR-149322] N77-13530
Effects of stream-associated fluctuations upon the radial variation of average solar-wind parameters
[NASA-CR-149316] N77-13950

JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
Liquid rocket space engines
[NASA-TT-F-17503] N77-13144

K

KANNER [LEO] ASSOCIATES, REDWOOD CITY, CALIF.
Some results of the flight testing of the onboard equipment of the MMR-06 meteorological rocket
[NASA-TT-F-17507] N77-13393
Correlation of geophysical fields and space images in the southern part of the Siberian platform
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Aerospace and ground methods of studying of late quaternary fissures [based on the zone of the Chief Kopetdag fracture]
[NASA-TT-F-16955] N77-13509

KENT STATE UNIV., OHIO.
The transport of selected inorganic gases through activated carbon
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KIRUNA GEOPHYSICAL INST. [SWEDEN].
Kiruna geophysical data
[REPT-75/10-12] N77-13594

KLEBER-COLOMBES [FRANCE].
Reinforcement of composite materials consisting of elastomers and variable plasticity fillers
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LABORATOIRE CENTRAL DE RECHERCHES THOMSON-CSF, ORSAY [FRANCE].
Passive components for optical multimode communication
[LCR-75-198/R/G5] N77-13828

LABORATOIRE DE GEOPHYSIQUE EXTERNE DU C.N.R.S., ST. MAUR-DES-FOSSES [FRANCE].
Experiment Araks: Measurement of quasi-static natural or artificial electric fields and of the ion temperature using retarding potential ion analyzers
[LGE-002] N77-13086
ARAKS 1975 experiment: Sounding rocket onboard spectral analysis instrumentation
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Wave measurement in the ARAKS experiment
[LGE-001] N77-13141

LABORATOIRE DE RECHERCHES BALISTIQUES ET AERODYNAMIQUES, VERNON [FRANCE].
Development and tests of a simulator for a pendulum accelerometer
[LRBA-E-410-NT-32/SYE] N77-13079

LABORATORIO DI RICERCA E TECHNOLOGIA PER LO STUDIO DEL PLASMA NELLO SPAZIO, FRASCATI [ITALY].
Position sensors
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Measurement of the equivalent circuit parameters of a gravitational antenna
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LABORATORIUM FUER BETRIEBSFESTIGKEIT, DARMSTADT [WEST GERMANY].
Significance of the irregularity of Gaussian random sequences on fatigue life
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The amplitude transformation procedure
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LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N.Y.
Gravity, magnetics, and seismicity
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LEHIGH UNIV., BETHLEHEM, PA.
A comparison of several analysis of variance statistics by type 1 error rates
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LIGNES TELEGRAPHIQUES ET TELEPHONIQUES, CONFLANS-SAINTE-HONORINE [FRANCE].
Characterization of dielectric and magnetic properties of liquid crystals at hyperfrequencies
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LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Kalman filter configurations for multiple radar systems
[AD-A026367] N77-13312
Predicted and measured detection capabilities of the Lincoln ETS, photon-noise-limited, electro-optical systems
[AD-A025859] N77-13833

LITTON SYSTEMS, INC., MORRIS PLAINS, N.J.
Research on crystal growth of optical and laser materials
[AD-A025821] N77-13884

LOCKHEED-CALIFORNIA CO., BURBANK.
Feasibility and tradeoffs of a transport fuselage fire management system
[AD-A029242/5] N77-13045

LOCKHEED ELECTRONICS CO., HOUSTON, TEX.
Elevon design review
[NASA-CR-151127] N77-13124
Remote sensing for control of tsetse flies
[NASA-CR-151136] N77-13491

LOCKHEED MISSILES AND SPACE CO., HUNTSVILLE, ALA.
Wake vortex and groundwind meteorological measurements
[AD-A029164/1] N77-13018
EDL performance model. Part 3: Analysis of closed cycle electron-beam sustained CO2 EDL with air contaminant
[AD-A025404] N77-13412

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
On the selection of the working range of a magnetic correction system of the kinetic moment
N77-13388

LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.
STARPAHC Interim Evaluation Report, May 1975 - April 1976
[NASA-CR-151126] N77-13648

LOMA LINDA UNIV., CALIF.
Computer assisted electron spin resonance spectral analysis of trapped radicals
N77-13179
LOUISIANA STATE UNIV., BATON ROUGE.
A three-dimensional, time-dependent model of Mobile Bay
[NASA-CR-150110] N77-13625
Studies in optimal control, estimation and linear systems theory
[AD-A025126] N77-13718
LOUISVILLE UNIV., KY.
Molecular complexes of antimony trichloride with aromatic compounds containing carbonyl functional groups: A crystallographic study
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LUMIN, INC., TUSCALOOSA, ALA.
Speckle reference beam holographic and speckle photographic interferometry in non-destructive test systems
[NASA-CR-150122] N77-13392
LYON UNIV. [FRANCE].
Effect of the load in a contact with boundary lubrication
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M

M&S COMPUTING, INC., HUNTSVILLE, ALA.
Implementation of Large Scale Integrated [LSI] circuit design software
[NASA-CR-150069] N77-13697
MARINE CORPS DEVELOPMENT AND EDUCATION COMMAND, QUANTICO, VA.
Landing force integrated communications system architecture, 1976 - 1990
[AD-A025855] N77-13300
MARQUETTE UNIV., MILWAUKEE, WIS.
An investigation of the influence of grain boundaries on the electrical behavior of polycrystalline ZrO2-CaO
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MARTIN MARIETTA CORP., DENVER, COLO.
Hearing aid malfunction detection system
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Definition study for photovoltaic residential prototype system
[NASA-CR-135056] N77-13533
Comparison of the nonlinear dynamic characteristics of Barber S-2 and ASF ride control freight trucks
[NASA-CR-150113] N77-13655
MARYLAND UNIV., COLLEGE PARK.
Spacelab experiment definition study on phase transition and critical phenomena in fluids: Interim report on experimental justification
[NASA-CR-135070] N77-13090
Pattern analysis, modeling and classification
[AD-A025207] N77-13704
MASCHINENFABRIK AUGSBURG-NUERNBERG A.G., MUNICH [WEST GERMANY].
Possibilities for industrial material production and processing techniques in space from the mechanical engineering point of view
[BMFT-FB-W-76-03] N77-13094
MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Research on the exploitation of advanced composite materials to lightly loaded structures
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A dual-mode generalized likelihood ratio approach to self-reorganizing digital flight control system design
[NASA-CR-149317] N77-13070
Activation studies in the oxidation of graphite
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A study of the higher modal dynamic plastic response of beams
[AD-A025204] N77-13482
Wind energy conversion
[PB-256198/3] N77-13552
Performance and sensitivity analysis of the generalized likelihood ratio method for failure detection
[NASA-CR-149272] N77-13761
The use of harmonic analysis in suboptimal estimator design
[AD-A027707] N77-13770
MASSACHUSETTS UNIV., AMHERST.
Studies on the orientation and deformation properties of low and high density polyethylenes
N77-13220
MAX-PLANCK-INSTITUT FUER PHYSIK UND ASTROPHYSIK, GARCHING [WEST GERMANY].
Bow shock associated proton heating in the upstream solar wind
[MPI-PAE/EXTRATERR-118] N77-13953
MAX-PLANCK-INSTITUT FUER STROEMUNGSFORSCHUNG, GOETTINGEN [WEST GERMANY].
Investigations of elementary reactions in the gas phase in the H-O-Cl system with the electron spin resonance O + HCl and OH + HCl
[REPT-3/1976] N77-13182
Rate constant measurement of the reaction of hydrogen atoms and hydroxyl radicals with carbon suboxide in the temperature range 295 K to 480 K
[REPT-6/1976] N77-13183
A pseudopotential calculation of the alkali-mercury systems including the lowest P-states of the alkali
[REPT-13/1975] N77-13213
Observations of the particle number density of two-phase flows in microchannels using laser anemometry
[REPT-4/1976] N77-13376
Some aspects of the averaging effects in measured differential cross sections
[REPT-12/1975] N77-13815
Electronic excitation by atomic collisions
[REPT-14/1975] N77-13816
MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
Generalized EC&LSS computer program configuration control
[NASA-CR-151121] N77-13695
MCGILL UNIV., MONTREAL [QUEBEC].
The virtual mass matrix of a cluster of cylinders in liquid contained by a rigid outer cylinder
[MERL-76-1] N77-13370
MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., OTTOBRUNN [WEST GERMANY].
Failure limits of hybrid materials
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Modification of stratified rupture analysis
[BMFT-FB-LFF-73] N77-13159
Determination of nonlinear material properties
[BMFT-FB-LFF-75-32] N77-13160
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[BMFT-FB-LFF-75-32] N77-13161
Rigid plastic foam insulation for cryogenic application
[BMFT-FB-T-76-31] N77-13267
METALLGESELLSCHAFT, A.G., FRANKFURT AM MAIN [WEST GERMANY].
Development of a high strength aluminum alloy of the type AlZnMg, which is weldable and insensitive to stress corrosion cracking
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METAVAC, INC., FLUSHING, N.Y.
Production engineering measures for filter, infrared, interference-absorption type
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Laser application to measure vertical sea temperature and turbidity, design phase
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Properties of semiconductor materials for high-power microwave generation
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Some aspects of the Weiner noise model
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MINNESOTA UNIV., MINNEAPOLIS.
Organizational strategies for protection against back contamination
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MISSOURI UNIV., KANSAS CITY.
Rings in which every element commutes with its endomorphic images
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MITRE CORP., ATLANTIC CITY, N.J.
Performance of a correlation-sensitive radar detection technique
[AD-A030155/6] N77-13289
MITRE CORP., MCLEAN, VA.
Survey of alcohol fuel technology, volume 1
[PB-256007/6] N77-13232
Survey of alcohol fuel technology, Volume 2
[PB-256008/4] N77-13233
MONSANTO RESEARCH CORP., DAYTON, OHIO.
Source assessment: Prioritization of stationary air pollution sources. Model description
[PB-253479/0] N77-13564
MOTOROLA, INC., SCOTTSDALE, ARIZ.
Shuttle/TDRSS Ku-band downlink study
[NASA-CR-151134] N77-13126

N

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D.C.
NASA's university program: Active grants and research contracts, fiscal year 1976
[NASA-TM-X-74142] N77-13891
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Wind-tunnel investigation of a large-scale model of a lift-cruise fan V/STOL aircraft with extended lift-cruise nacelles
[NASA-TM-X-73164] N77-12999
NASA Ames potential flow analysis [POTFAN] geometry program [POTGEM], version 1
[NASA-TM-X-73127] N77-13000
Operational characteristics of a capacitive potentiometric shaft angle encoding transducer
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[NASA-TM-X-73173] N77-13061
Smoke generator
[NASA-CASE-ARC-10905-1] N77-13418
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. HUGH L. DRYDEN FLIGHT RESEARCH CENTER, EDWARDS, CALIF.
Semiempirical airframe noise prediction model and evaluation with flight data
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
NASA tracking ship navigation systems
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[NASA-CASE-GSC-12143-1] N77-13391
LANDSAT US standard catalog, 1-30 Sep. 1976
[NASA-TM-X-74302] N77-13487
LANDSAT US standard catalog, 1-31 October 1976
[NASA-TM-X-74303] N77-13488
LANDSAT non-US standard catalog
[NASA-TM-X-74304] N77-13489
LANDSAT non-US standard catalog
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Magnetic anomaly map of North America south of 50 degrees north from Pogo data
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[NASA-TM-X-71234] N77-13947
Recurrent X-ray outbursts from Aquila X-1
[NASA-TM-X-71236] N77-13960
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
Stator rotor tools
[NASA-CASE-MSC-16000-1] N77-13062
Hearing aid malfunction detection system
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Water monitor system: Phase 1 test report
[NASA-TM-X-58179] N77-13909
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.
A simplified method for calculating temperature time histories in cryogenic wind tunnels
[NASA-TM-X-73949] N77-13076
The design and fabrication of microstrip omnidirectional array antennas for aerospace applications
[NASA-TM-X-73979] N77-13332
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 1: Data processing and transfer panel
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NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 2: Sensing and data acquisitions panel
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NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 4: Power technology panel
[NASA-TM-X-73964] N77-13913
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 5: Propulsion technology panel, part 1
[NASA-TM-X-73965] N77-13914

NASA Office of Aeronautical and Space Technology Summer Workshop. Volume 6: Structures and dynamics panel
[NASA-TM-X-73966] N77-13915
NASA Office of Aeronautical and Space Technology Summer Workshop. Volume 7: Materials panel
[NASA-TM-X-73967] N77-13916
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 8: Thermal control panel
[NASA-TM-X-73968] N77-13917

NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 9: Entry technology panel
[NASA-TM-X-73969] N77-13918
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 10: Basic research panel
[NASA-TM-X-73970] N77-13919
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 11: Life support panel
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NASA Office of Aeronautics and Space Technology Summer Workshop. Executive summary
[NASA-TM-X-73960] N77-13921

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

Cost/benefit assessment of the application of composite materials to subsonic commercial transport engines
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Interim prediction method for turbine noise
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Phase diagrams of metallic systems [alphabetical cumulative alloy system index and table of contents]
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Overview of NASA/OAST efforts related to manufacturing technology
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Microwave power tubes for space applications
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Automotive gas turbine fuel control
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Heavy section fracture toughness screening specimen
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Wind tunnel measurements of the tower shadow on models of the ERDA/NASA 100 KW wind turbine tower
[NASA-TM-X-73548] N77-13534
Standardized performance tests of collectors of solar thermal energy - A flat-plate copper collector with parallel mylar striping
[NASA-TM-X-73553] N77-13535
Standardized performance tests of collectors of solar thermal energy: An evacuated flatplate copper collector with a serpentine flow distribution
[NASA-TM-X-73415] N77-13536
Status of the ERDA/NASA photovoltaic tests and applications project
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An experimental investigation with artificial sunlight of a solar hot-water heater
[NASA-TM-X-73534] N77-13538
NASA Global Atmospheric Sampling Program [GASP] data report for tape VL0004
[NASA-TM-X-73574] N77-13563
Acoustic signatures of a model fan in the NASA-Lewis anechoic wind tunnel
[NASA-TM-X-73560] N77-13792

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

Spacelab experiment computer study. Volume 1: Executive summary [presentation]
[NASA-TM-X-73349-VOL-1] N77-13097
Spacelab experiment computer study. Volume 2: Study elements and approach
[NASA-TM-X-73349-VOL-2] N77-13098
Spacelab experiment computer study. Volume 3: Spacelab cost data
[NASA-TM-X-73349-VOL-3] N77-13099
Spacelab experiment computer study. Volume 4: Spacelab user cost data [central experiment computer]
[NASA-TM-X-73349-VOL-4] N77-13100
Spacelab experiment computer study. Volume 5: Spacelab user cost data [distributed computer]
[NASA-TM-X-73349-VOL-5] N77-13101
Application of redundancy in the Saturn 5 guidance and control system
[NASA-TM-X-73352] N77-13102
Contamination from Skylab as determined from the solar coronagraph data
[NASA-TM-X-73353] N77-13138

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. PASADENA OFFICE, CALIF.

High temperature oxidation resistant cermet compositions
[NASA-CASE-NPO-13666-1] N77-13217
Frequency discriminator and phase detector circuit
[NASA-CASE-NPO-11515-1] N77-13315

NATIONAL AEROSPACE LAB., AMSTERDAM [NETHERLANDS].

High subsonic and transonic effects in unsteady aerodynamics
[NLR-TR-75079-U] N77-13014
The scratch strain gage as a fatigue damage monitoring system
[NLR-TR-75094-U] N77-13394
Environmental fatigue crack propagation in Ti-6Al-4V sheet
[NLR-MP-74023-U-REV] N77-13437

NATIONAL AVIATION FACILITIES EXPERIMENTAL CENTER, ATLANTIC CITY, N.J.

Test and evaluation of ATCRBS electronic scan antenna [system test]
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Photographic investigation of modified fuel breakup and ignition
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Test and evaluation of a phototype VHF low-intermodulation amplifier
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Spacelab experiment definition study on phase transition and critical phenomena in fluids: Interim report on experimental justification
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Slow crack growth in ceramic materials at elevated temperatures
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NATIONAL ENFORCEMENT INVESTIGATIONS CENTER, DENVER, COLO.

Characterization and evaluation of wastewater sources United States Steel Corporation, National Plant, Pittsburgh, Pennsylvania, 3-6 February 1976
[PB-255585/2] N77-13565
Characterization and evaluation of wastewater sources United States Steel Corporation, Clairton Works, Pittsburgh, Pennsylvania, 28-31 January 1976
[PB-255586/0] N77-13566
Characterization and evaluation of wastewater sources United States Steel Corporation, Irvin Plant, Pittsburgh, Pennsylvania, 18-28 August 1975
[PB-255588/6] N77-13567
Characterization and evaluation of wastewater sources United States Steel Corporation, Edgar Thomson Plant, Pittsburgh, Pennsylvania, 22 July - August 1975
[PB-255589/4] N77-13568

NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D.C.

The use of the radiosonde in deriving temperature soundings from the Nimbus and NOAA satellite data
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A historical summary of earthquake epicenters in and near Alaska
[PB-257258/4] N77-13600
Solar-geophysical data number 381, part 1 [prompt reports]. Data for April-March 1976. Explanation of data reports issued as number 378 [supplement] February 1976
[PB-247137-381-1] N77-13954
Solar-geophysical data number 381, part 2 [comprehensive reports]. Data for November-October 1975 and miscellanea. Explanation of data reports issued as number 378 [supplement] February 1976
[PB-247137-381-2] N77-13955
Solar-geophysical data number 380, part 1 [prompt reports]. Data for March-February 1976. Explanation of data reports issued as number 378 [supplement] February 1976
[PB-247137-380-1] N77-13956
Solar-geophysical data number 380, part 2 [comprehensive reports]. Data for October-September 1975 and miscellanea. Explanation of data reports issued as number 378 [supplement] February 1976
[PB-247137-380-2] N77-13957

NATIONAL LENDING LIBRARY FOR SCIENCE AND TECHNOLOGY, BOSTON SPA [ENGLAND].

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[NLL-M-25396-[5828.4F]] N77-13173
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[NLL-M-25331-[5828.4F]] N77-13190
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[NLL-M-24129-[5828.4F]] N77-13898

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Medical subject headings, tree structures, 1977
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NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH.

Seasonal surface currents off the coasts of Vancouver Island and Washington as shown by drift bottle experiments
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NATIONAL MATERIALS ADVISORY BOARD, WASHINGTON, D.C.

Application of fracture mechanics analysis techniques in high performance Marine systems
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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SUITLAND, MD.

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Nonfatal, weather-involved general aviation accidents
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Statistical review of counting accelerometer data for Navy and Marine fleet aircraft
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NAVAL AIR ENGINEERING CENTER, LAKEHURST, N.J.

Analysis and design of an electro-mechanical optical landing system for helicopters at night in varying sea states
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NAVAL AIR PROPULSION TEST CENTER, TRENTON, N.J.

Evaluation of a JP-5 type fuel derived from oil shale
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NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.

Engineering properties of epoxy resin as a structural adhesive for cracked reinforced concrete waterfront facilities
[AD-A025400] N77-13169
Materials for oil spill containment boom
[AD-A026139] N77-13577

NAVAL ENVIRONMENTAL PREDICTION RESEARCH FACILITY, MONTEREY, CALIF.

Calibration, earth location and mapping programs for the Nimbus-5 Electronically Scanning Microwave Radiometer [ESMR]
[AD-A027226] N77-13520

NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND, BETHESDA, MD.

Bibliography of reported biological phenomena [effects] and clinical manifestations attributed to microwave and radio-frequency radiation, supplement number 7
[AD-A025354] N77-13650

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.

Trends in major aircraft accident rates
[AD-A027256] N77-13030
Laser effects handbook. 3: Laser absorption wave phenomena
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Oceanographic investigation of the marginal sea-ice zone of the Chukchi Sea: Mizpac 1974
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Hydraulic ram effect on composite fuel cell entry walls
[AD-A024832] N77-13548
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[AD-A026461] N77-13629
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[AD-A025413] N77-13747
Kolmogorov-Smirnov test for discrete distributions
[AD-A024845] N77-13748
Structures, analysis and design of N-dimensional recursive digital filters
[AD-A024830] N77-13749
An investigation of the properties of the exponential moving average point process
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NAVAL RESEARCH LAB., WASHINGTON, D.C.

Intermodulation considerations for the GAP-FILLER satellite
[AD-A024831] N77-13116

Ambient air quality data management at NRL
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Optimal spectral estimates
[AD-A026982] N77-13752
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
DEAS information networks study. Phase 1: Current ship-shore information transfer description
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Structure of lithium-boron alloys and their performance as potential anodes for high power molten salt batteries
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Laser helicopter gunner trainer
[AD-A024836] N77-13088
NAVAL UNDERWATER SYSTEMS CENTER, NEW LONDON, CONN.
FORTRAN program for multivariate linear predictive spectral analysis, employing forward and backward averaging
[AD-A024982] N77-13698
Time delay estimation
[AD-A025408] N77-13796
NEBRASKA UNIV., LINCOLN.
Controllability of nonlinear systems
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Internal reflection ellipsometry of liquid-liquid interfaces
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Study of the ellipsometric function of a film-substrate system and applications to the design of reflection-type optical devices and to ellipsometry
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Municipal wastes as a fertilizer source
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NEDERLANDS INSTITUUT VOOR PRAEVENTIEVE GENEESKUNDE TNO, LEIDEN.
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Human command and control tasks: Description of an investigation on four different command and control tasks
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Analysis of a heat pipe exchanger
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Behavior of reinforced concrete beams under combined axial and lateral loading
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A numerical algorithm for the solution of implicit algebraic-differential systems of equations
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A metric graph structure for information retrieval
N77-13899
NEW YORK SEA GRANT INST., ALBANY.
Gravity, magnetics, and seismicity
[PB-257266/7] N77-13601
NORTH CAROLINA UNIV., CHAPEL HILL.
The mean square error of the estimate as a criterion for the assessment of alternative approaches to matching in a dual record system
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NORTH TEXAS STATE UNIV., DENTON.
Spectroscopic investigation of some allyl alkali metal compounds
N77-13196
NORTHWESTERN UNIV., EVANSTON, ILL.
Heat extraction from hot dry rock masses
[PB-256775/8] N77-13556
NORTON CO., WORCESTER, MASS.
Finishing techniques for silicon nitride bearings
[AD-A025350] N77-13434

O

OAK RIDGE NATIONAL LAB., TENN.
Inventory of energy research and development [1973 - 1975], volume 1
[GPO-64-734-VOL-1] N77-13525
Inventory of energy research and development [1973 - 1975], volume 2
[GPO-64-734-VOL-2] N77-13526
Inventory of energy research and development [1973 - 1975], volume 3
[GPO-64-734-VOL-3] N77-13527
Inventory of energy research and development [1973 - 1975], volume 4
[GPO-64-734-VOL-4] N77-13528
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, TOULOUSE [FRANCE].
Junction circulators
[ONERA-CERT-1-1047] N77-13326
OFFICE OF TELECOMMUNICATIONS, WASHINGTON, D.C.
Community Information and Services Centers [CISC's]: Concepts for activation
[PB-256428/4] N77-13901
OHIO STATE UNIV., COLUMBUS.
Asymptotic solution for two-dimensional viscous supersonic and hypersonic flows past compression and expansion corners
N77-12995
Comparative evaluation of stored-pattern classifiers for radar aircraft identification
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Analysis of aircraft wing-mounted antenna patterns
N77-13283
The transient response of adaptive arrays in TDMA systems
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Effects of pressure on kinetics of crystal nucleation in lithium disilicate glass
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The characteristics of the red spectra of the late-type supergiants
N77-13934
The catalytic production of interstellar molecular hydrogen
N77-13937
OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS.
Monitoring of crustal movements in the San Andreas fault zone by a satellite-borne ranging system
[NASA-CR-149246] N77-13585
OKLAHOMA STATE UNIV., STILLWATER.
Monte Carlo Bayesian system reliability and MTBF-confidence assessment
[AD-A025820] N77-13440
OKLAHOMA UNIV., NORMAN.
Multivariate experimental design in meteorology
N77-13612
Generalized convexity structures and their products
N77-13730
The molecular dipole model and the internal optic modes of the sulfate ion in different crystalline systems
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Statistical and spectrophotometric identification of binaries in star clusters
N77-13933
OLD DOMINION UNIV., NORFOLK, VA.
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 1: Data processing and transfer panel
[NASA-TM-X-73961] N77-13910
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 2: Sensing and data acquisitions panel
[NASA-TM-X-73962] N77-13911
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 3: Navigation, guidance and control panel
[NASA-TM-X-73963] N77-13912
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 4: Power technology panel
[NASA-TM-X-73964] N77-13913
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 5: Propulsion technology panel, part 1
[NASA-TM-X-73965] N77-13914
NASA Office of Aeronautical and Space Technology Summer Workshop. Volume 6: Structures and dynamics panel
[NASA-TM-X-73966] N77-13915
NASA Office of Aeronautical and Space Technology Summer Workshop. Volume 7: Materials panel
[NASA-TM-X-73967] N77-13916
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 8: Thermal control panel
[NASA-TM-X-73968] N77-13917
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 9: Entry technology panel
[NASA-TM-X-73969] N77-13918
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 10: Basic research panel
[NASA-TM-X-73970] N77-13919
NASA Office of Aeronautics and Space Technology Summer Workshop. Volume 11: Life support panel
[NASA-TM-X-73971] N77-13920
NASA Office of Aeronautics and Space Technology Summer Workshop. Executive summary
[NASA-TM-X-73960] N77-13921
OLD DOMINION UNIV. RESEARCH FOUNDATION, NORFOLK, VA.
TAP 1: A finite element program for steady-state thermal analysis of convectively cooled structures
[NASA-CR-145069] N77-13367
OPTIMIZATION SOFTWARE, INC., LOS ANGELES, CALIF.
Improvements in aircraft extraction programs
[NASA-CR-145090] N77-13043
OREGON UNIV., EUGENE.
An investigation of change in direct labor requirements resulting from changes in airframe production rates
[AD-A026112] N77-13269
ORWIN ASSOCIATES, INC., WEST BABYLON, N. Y.
Reliability study of display units for tactical support center
[AD-A025153] N77-13441

P

PARIS-SUD UNIV., ORSAY [FRANCE].
Spectral and scattering theory of the Schroedinger equation for three-body systems
[LPTHE-76/9] N77-13889
PARIS UNIV. [FRANCE].
Mechanical properties of ultrapure titanium at temperatures lower than 100 C
N77-13207
PEAT, MARWICK, MITCHELL AND CO., SAN FRANCISCO, CALIF.
Report of the Saint Louis Airport investigation, phase 2
[AD-A026765] N77-13029
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
The numerical solution of the steady flow of Newtonian and non-Newtonian fluids through a contraction
N77-13360
Effect of lubrication additives on flow in thin films
N77-13363
The specification, design and implementation of the interface system for a color display system
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Application of stochastic approximation to frequency domain adaptive filters
N77-13757
A theoretical and experimental study of acoustic propagation in multisectioned circular ducts
N77-13790
Numerical calibration of stellar models
N77-13932
PENNSYLVANIA UNIV., PHILADELPHIA.
Structural synthesis with stress and local instability constraints
N77-13448
The initial growth of data-related errors in mesoscale numerical weather prediction models
N77-13605
PHILIPS GLOEILAMPENFABRIEKEN N. V., EINDHOVEN [NETHERLANDS].
Visual approach slope indicators. Principles of operation, recommendations for installation and maintenance
[PHILIPS-ER-12] N77-13040
SI metric terms and their radiometric and photometric derivations
[PHILIPS-ER-20] N77-13041
PHYSICAL SCIENCES, INC., WAKEFIELD, MASS.
Advanced H2-HCl gas dynamic laser, phase 2
[AD-A025357] N77-13416
PICATINNY ARSENAL, DOVER, N.J.
MOMENTS-2: A computer program to calculate moments and products of inertia of asymmetric objects
[AD-A025409] N77-13786
PITTSBURGH UNIV., PA.
Transient physiological responses to step changes in work rate
N77-13643
Estimation of linear time series models
N77-13739
A numerical solution of the anisotropic thermal diffusion equation with experimental verification
N77-13864
Microwave absorption study of impure superconducting aluminum in a magnetic field
N77-13866
PLANNING AND CONSERVATION FOUNDATION, SACRAMENTO, CALIF.
The marginal cost and pricing of electricity: An applied approach
[PB-255967/2] N77-13905

POLAR RESEARCH LAB., INC., SANTA BARBARA, CALIF.
Arctic research in environmental acoustics [AREA] technical report no. 2: Preliminary radio performance predictions for the Arctic environmental buoy [AEB] [AD-A026552] N77-13311
POLITECNICO DI MILANO [ITALY].
Some rainfall rate statistics from radar data N77-13242
Opportunities offered by the Sirio satellite for propagation research N77-13247
POST OFFICE RESEARCH DEPT., IPSWICH [ENGLAND].
Satellite propagation and interference experiments at the UK Post Office Research Center N77-13248
POST TELEFON UND TELEGRAFEN BETRIEBE, BERN [SWITZERLAND].
Probabilities of the occurrence of rain cells and rain attenuation N77-13245
Measurement of attenuation and circular cross-polarisation discrimination at 13 GHz on a slant path N77-13250
POSTERIJEN, TELEGRAFIE EN TELEFONIE, THE HAGUE [NETHERLANDS].
An experimental radio link for the investigation of the depolarisation of horizontal and vertical polarised signals at a frequency of 11.5 GHz N77-13258
PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
Experimental clean combustor program, phase 2 [NASA-CR-134969] N77-13059
Stress analysis, thermomechanical fatique evaluation, and root subcomponent testing of gamma/gamma prime-delta eutectic alloy [NASA-CR-135005] N77-13060
PRC INFORMATION SCIENCES CO., MCLEAN, VA.
Graphic line symbolization system. Volume 1: Systems analysis and design [AD-A025686] N77-13669
Graphic line symbolization system. Volume 2: System implementation, operating procedures and testing [AD-A025687] N77-13670
Graphic line symbolization system. Volume 3: Program documentation [AD-A025688] N77-13671
PRC INFORMATION SCIENCES CO., ROME, N.Y.
Analog to digital graphic conversion [AD-A026137] N77-13705
PRINCETON UNIV., N.J.
An experimental study of instability and transition in an axisymmetric wake N77-12997
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Systematic sampling of two-dimensional surfaces and related problems [AD-A027714] N77-13769
RESOURCE PLANNING ASSOCIATES, INC., CAMBRIDGE, MASS.
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Digital fly-by-wire technology study, volume 1 [AD-A027689] N77-13075
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Inlet distortion scaling of wind tunnel model results [NASA-CR-143840] N77-13066
ROHDE AND SCHWARTZ, MUNICH [WEST GERMANY].
Development of functional microstrip components [BMFT-FB-T-76-28] N77-13296
Vapor deposited thin film circuits on ceramic substrates [BMFT-FB-T-76-26] N77-13339
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Development of failure-rate models for semiconductor optoelectronic devices [AD-A029163/3] N77-13435
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Communication requirements for terrestrial and space radio-links at frequencies above 10 GHz N77-13240
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The effect of geometry on the fatigue strength of aluminium alloy lugs [ARC-CP-1349] N77-13211
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The reduction of base strain sensitivity of a triaxial accelerometer by the use of a mounting pad [RAE-TM-IT-157] N77-13398
ROYAL GREENWICH OBSERVATORY, HERSTMONCEUX [ENGLAND].
Greenwich time report, October - December 1975 N77-13927
ROYAL NETHERLANDS AIRCRAFT FACTORIES FOKKER, AMSTERDAM.
Fatigue tests on two sides clad-, one side machined and one side chemmilled 2024-T3- and 7075-T6 clad sheet [AvB 1435] [SP-80] N77-13456
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Experimental implementation of a FORMAT D message analyser by syntactic specification [RSRE-76004] N77-13294

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SCIENCE APPLICATIONS, INC., LA JOLLA, CALIF.
Propagation effects of large phase variations in a striated plasma
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SCIENTIFIC TRANSLATION SERVICE, SANTA BARBARA, CALIF.
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Rules for generalization of images of certain indicators of geological structure on space photographs
[NASA-TT-F-16951] N77-13505
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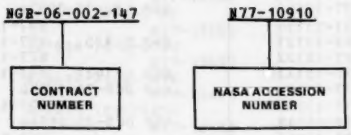

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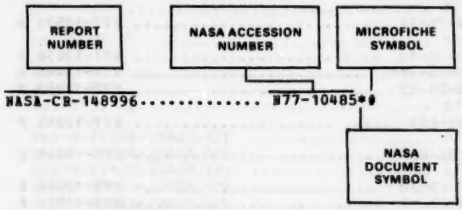

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MCR-76-475 ..... N77-13655*#

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